The Dock and Harbour Authority

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Editorial Comments

Moroccan Port Development.

On the north-west corner of the Continent of Africa lies a country, until recently and perhaps still, somewhat indefinite in extent and with a vague inland boundary, a country of mystery and veiled secrecy, whose native inhabitants, nomadic and inpassive, with inscrutable eyes and clad in the strange garb of the East, are a standing source of interest to the traveller from the more highly civilised states of Western Europe. In a nebulous way, most people are conscious of the Moors as a swarthy, rather turbulent race, who in the Middle Ages made incursions into Spain, leaving permanent marks of their presence and influence. It is only within recent times that the Moroccan country has been opened up to the explorer, the trader and the holiday visitor. At the beginning of the present century, maps were still vague in their details of the hinterland and it was not until France had definitely extended a protectorate over the Cherifian State in 1912, that methods of "peaceful penetration" were consistently pursued with successful results.

To-day, standing in the streets of Casablanca, the former city of Anfa, surrounded by its noble buildings of modern design and delightful gardens of tasteful lay-out, or on the quays of the expansive and well-equipped harbour, the tourist finds it difficult to realise that he is not in a modern metropolis of Western Europe. The French, during their period of occupation, have laid insistent and impressive hands upon the plastic topography of the place and converted it into a typical centre of French culture and commercial enterprise.

The approach to the Port of Casablanca is not so striking as might be expected. The seaboard is, generally speaking, low and flat. Sailing up the coast from the Canaries, one is conscious of a sameness bordering on monotony, and as one's vessel takes a wide sweep to enter the harbour fairway, there is little to indicate the variety of interest and pleasure which lie within and beyond.

We have on previous occasions described the port and its works. This is testimony to the vigour with which measures of development have been prosecuted. The present notice is due to the fact that, in July last, on the quay of the fishery basin, a complete modern installation of appliances for handling, marketing and despatching fish was inaugurated and brought into use. It is fully described in the article which appears in this number. At the time of a recent visit to the port, the undertaking was still incomplete, but we were much impressed with the up-to-date character of the design of the building forming the fish market and the cold store.

There are other features of interest in the port for the harbour official. There is a prominent grain silo of recent construction, and a warehouse of large size for the reception of phosphates. The coaling appliances also call for attentive inspection. We are indebted to Monsieur Bars, the Engineer-in-Chief of the port, and to Monsieur Surleau, one of his principal colleagues, for their courteous and informative guidance during a tour of the harbour and its environs, as also for the material and details from which the article and illustrated supplement have been prepared.

The commercial development of the French zone in Morocco is stated (in a recent Report on Economic and Commercial Conditions in Morocco, published by H.M. Stationery Office) to have been retarded lately by the Spanish Civil War. Spain, for instance, was the principal customer for Moroccan phosphates. As regards the United Kingdom, cotton goods have been swept out of the market by importations from Japan, but it is suggested that the motor car trade offers a favourable line for alternative development. "Many men require a long-consumption car to run about the extensive urban area of Casablanca on their business. 'Buses afford a very inadequate service. For these reasons it appears that the United Kingdom light car could find a substantial market in Morocco; a small number of these cars have been sold and they have given satisfaction to their owners."

The British Association

The meeting at the beginning of September of the British Association for the Advancement of Science, generally shortened to British Association, or B.A., is one of the most notable gatherings of the year, appealing not merely to the devotees of certain particular and abstruse branches of knowledge, but to that elusive and not easily definable individual, the man-in-the-street, whose interest is aroused by any striking scientific discovery or demonstration, which comes within the range of his experience of life. The rapid spread of educational facilities and the many opportunities, denied to former generations, now available for receiving University training have awakened an appetite for knowledge of all kinds. This is recognised in the policy of the Council of the Association, who stated in their programme for the meeting at Nottingham that they "have considered the growing strength of the public demand for a more systematic presentation of selected subjects of scientific investigation in their bearing on the life of the community."

This being so, we examined with particular interest the programmes of the various sectional groups of the Association to discover, if possible, points of contact with the practical problems of transport, as represented in port activities and the routine of overseas commerce, but finding nothing touching even remotely on such matters, we have had to conclude that these aspects of "the life of the community" were not envisaged in the Council's outlook. True, there was a public lecture of an elementary character on Rivers and Waterways, and an evening address on the Transport of Food, but these subjects can only be said to have a remote and partial affinity with the main question. We recall that two years ago there was an evening discourse at the Norwich meeting on Diesel Engines in relation to Coastwise Shipping, which was decidedly more to the point. This and a few more isolated instances, which no doubt could be traced, go to show that only the outermost fringe of port topics falls within the Association's present purview. We suggest that the neglect of so essential a branch of an island community's activities is regrettable and that an effort might be made to find room occasionally among other subjects of public concern for the discussion and elucidation of water transport problems of the present day. An approach to a body like the Institute of Transport would surely enable the Association to adopt an even wider view of the matters having a "bearing on the life of the community," which it is so commendably desirous of studying.

Manhattan Passenger Piers.

Towards the end of last year, a lecture was given to the Institute of Transport on Maritime Passenger Stations, which was published in the March issue of this Journal. Apparently, from lack of information, which was not forthcoming at the time, the lecture did not quite do justice to the recently-completed passenger piers at Manhattan Island, New York, which are now in use for the leading transatlantic services. We

Editorial Comments—continued

have pleasure, accordingly, in publishing in this issue a fully descriptive account of these piers, furnished by Dr. R. S. MacElwee, who sets out the important improvements in design and construction for passenger accommodation which have recently been effected, and which relegate to the background the old style of pier at which we landed on our last visit to America some ten years ago.

The change, undoubtedly, is very striking and represents a great advance, but there still remains several respects in which we venture to think the provision for the reception of passengers might be rendered even more agreeable. With so pronounced and continuous a stream of traffic, inwards and outwards, across the Atlantic between North America and Europe, we would have thought it practicable to allocate piers specifically and entirely to passenger accommodation, so as to avoid the regrettable necessity of receiving them in quay sheds (which unmistakably are quay sheds, structures of bare and unadorned steel framing) devoted, in part, to the reception and storage of goods. It is true, that the goods are confined to the lowermost floor and that passengers on the upper deck are not in actual contact with mercantile commodities, but none the less, a comparison between the Manhattan Piers and the sumptuous Ponte dei Mille at Genoa or the Passenger Jetty at Le Verdun, shows very much to the advantage of the European installations.

We do not wish to detract in any way from the excellence of the waiting room and lounge accommodation at Manhattan, which, so far as it goes, is all that could be desired. There is certainly a tremendous improvement over the standards of the past and even those of recent years. The movement for the betterment of passenger accommodation at port calls for every encouragement, and the improvements in connection with the Manhattan piers are cordially to be welcomed as a step in the right direction.

The Storstrom Viaduct.

Described in detail elsewhere in this issue, the viaduct across the Storstrom Channel connecting two of the main islands in the Archipelago of which the Kingdom of Denmark largely consists, is an engineering feat which presents features of interest from several points of view. With a length of fully two miles from shore to shore, it can claim to be the longest bridge in Europe across open sea. Moreover, it spans a waterway which is much frequented by shipping, for the passage of which, with adequate allowance for mast room, due provision had to be made. The method by which the foundations of the numerous piers were laid in the bed of the channel within a surprisingly short period of time reflects credit on the ingenuity and enterprise of the contractors for the work, who while Danish in nationality, have made a reputation for themselves in a number of other countries. The steelwork for the bridge came from an English firm and the joint production of the two firms is a commendable instance of international co-operation.

Shipbuilding Costs and Port Revenues

Not a little concern has been expressed lately in public, alike by shipowners and shipbuilders, at the steady and appreciable rise in the cost of ship construction, both as regards materials and labour. Shipowners, who have been expecting to recoup themselves for losses which have been experienced during the depression of recent years and are now not unwilling to place orders for additional tonnage, find themselves confronted with the dilemma that, while they require new vessels in order to take advantage of the expansion in trade, these vessels cannot be built at costs which are likely to be remunerative. The shipbuilders, too, although at present they may have no idle stocks, are anxious to secure fresh orders for their yards when the present orders are completed, but they cannot control the situation, nor solve the shipowners' problem, while costs are on a rising scale. Quite recently, Lord Craigmyle, Chairman of the British India Steam Navigation Company, on the occasion of a launch at Leith of a new ship for his company, said that " the prices of ships have to-day reached a level which makes it practically impossible for shipowners to entertain any hope of seeing even a moderate profit on their enterprise."

The matter is one, which while primarily affecting shipping concerns and shipbuilding yards, has a reflex action on port affairs. Ports cannot justify their existence, nor be run as successful undertakings, without ships to supply them with revenue in the shape of dues and charges; the greater the number and volume of shipping using a port, the better for its welfare and prosperity. Obviously then, port authorities must look with favour on a growth of shipping tonnage and regard with concern any influences which tend to check an upward movement in the volume of shipping and freights.

Unfortunately, there appears to be a recurrence of the old nightmare of the " vicious circle." Increasing employment means a decrease in the available supplies of labour and materials, with consequential rising rates and costs, tending to cause uneconomic production, and in the long run to bring about a cessation of activity and eventually unemployment again. It would seem as if some supervising control were needed to prevent the pendulum with its gathering momentum, from swinging too far in the direction of either extreme, but how this is to be achieved elsewhere or otherwise than in a totalitarian state is an extremely difficult thing to say. Still the problem ought not to be insuperable and the Government should take a hand in its solution. A strong merchant navy is a valuable asset to the country as a whole. Apart from the economic aspect of the matter, it would be folly to allow the British mercantile marine to fall in the scale of importance in world commerce.

Expanding Overseas Trade

The Board of Trade Returns for August, published on September 14th, continue to present an encouraging picture. Compared with August, 1936, the value of imports was over twenty millions higher, exports rose by seven-and-a-quarter millions and re-exports were increased by two-and-a-quarter millions. A notable feature of the exports was the pronounced increase in coal shipments in which there was a rise of £994,833 to £3,365,474. All these figures without exception, are welcome signs of a steady and continuous upward trend in British trade, which there is every reason to believe will continue for some time to come.

In this connection it is appropriate to note in a recently published report by the Convener of the Finance Committee of the Clyde Navigation Trust that the net registered tonnage of vessels entering and leaving the Port of Glasgow during the twelve months ended 30th June last, was the highest tonnage ever recorded at that port, viz., 15,132,553 tons.

Dockers' Pay and Port Rates

The agreed increase in pay for dock labourers of a shilling per day whereby the daily wages of men on time rates were to be raised to thirteen shillings at the greater ports and twelve shillings at the smaller ports, came into force on September 20th, and already, as might have been expected, the change is having an aftermath in a corresponding increase in port rates. The charges for labour and porterage at docks are being revised by port authorities and percentages added to cover the additional cost. The Port of London Authority have issued a detailed statement of various increases in dues and rent on vessels, and charges on shipping using the docks, and in dock rates and charges and rent on imported goods. The percentages vary in amount between 5% and 15%.

In the case of Garston, the London, Midland and Scottish Railway Company have announced an increment of 8½%, while at Liverpool, the Mersey Docks and Harbour Board have approved an addition of 6% in the master porters' rates. It is estimated that the increase in dockers' pay will cost the Port of Bristol an extra £43,000 per annum, and here, as elsewhere, early revision of existing rates is to be expected.

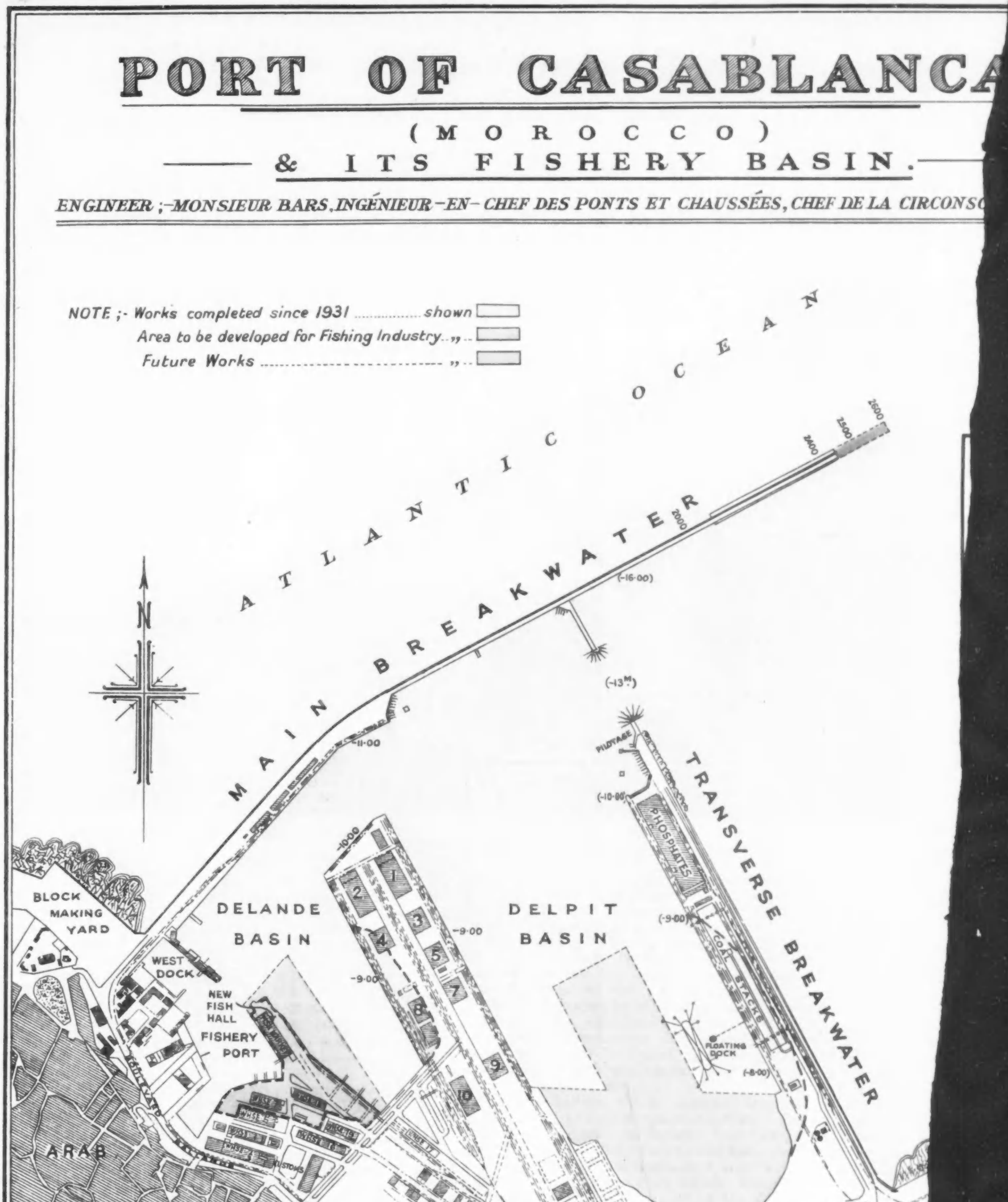
Not only are Port Authorities compelled to take action, but tug-owners are finding it necessary, in view of rising prices, to follow suit, and the London tug-owners have decided that next year their towage rates shall be increased by 10%.

It is an unfortunate corollary of these rises in pay that they are necessarily accompanied by higher charges on the commodities handled, which, in turn, have to be passed on to the merchant and the consumer, resulting in an upward trend in the cost of living. Thereupon the docker, in common with other industrial workers, begins again to feel the pinch, becomes dissatisfied with his pay and like Oliver Twist, asks for more. It is in fact another instance of the " vicious circle " to which we have alluded in a preceding comment.

Estuary Channel Dredging

In order to meet the loaded draught of certain modern liners using the port, the Harbour Board of Southampton find themselves under the necessity of incurring a further heavy bill for dredging operations. It is announced that a section of the approach channel in Southampton Water is to be deepened by a foot at a cost of £76,000.

Added to antecedent outlay on dredging work, the expenditure in question makes an appreciable, and even serious, demand upon the Board's financial resources, and, as it is to be incurred for the sake of five ships only, the careful deliberation of the Board in weighing the advantages against the cost is understandable. Yet, these five ships are considered to be essential to the prosperity and prestige of the port and the Board have decided to make the necessary provision. Their courageous attitude is commendable. The matter illustrates very pointedly the responsibility resting upon port authorities who have to provide accommodation for shipping of large calibre. The expense incurred on account of a few such vessels is a seriously disproportionate item in the port budget. Happily, in the case of Southampton the outlook is favourable. The trade of the port is good and is increasing.


PORT OF CASABLANCA
(MOROCCO)
& ITS FISHERY BASIN.
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BLOCK MAKING YARD
WEST DOCK
NEW FISH HALL
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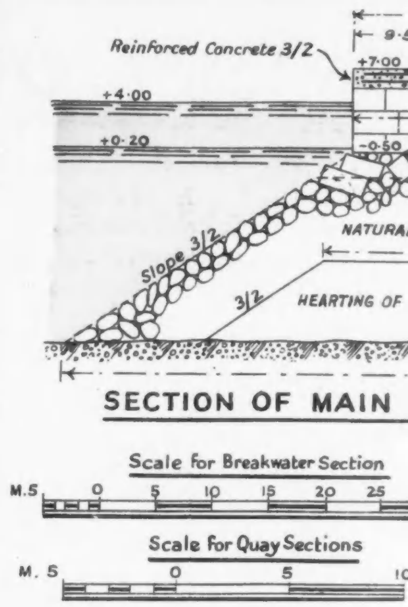

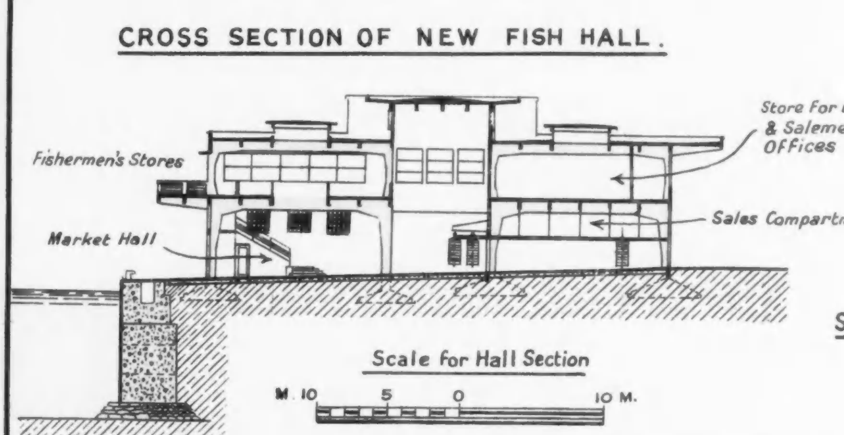

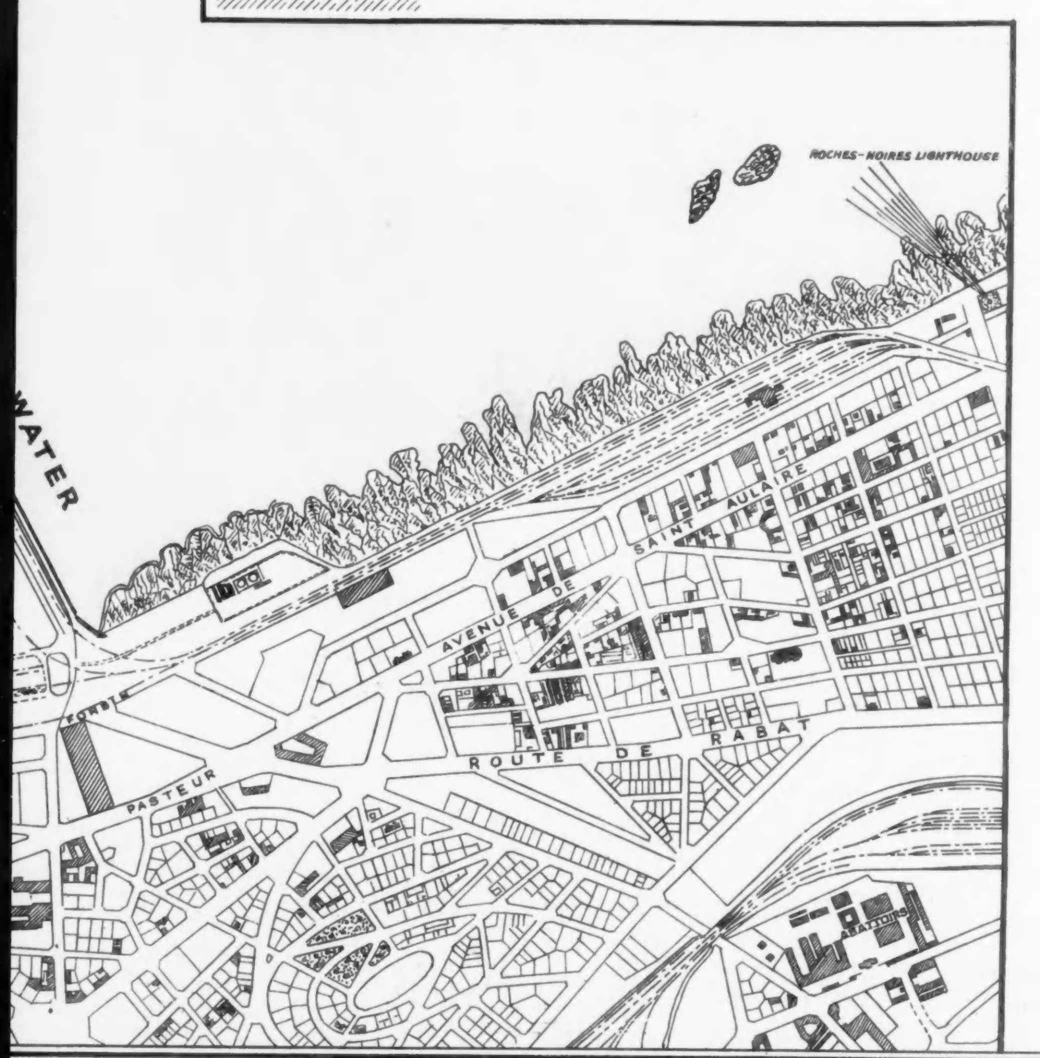

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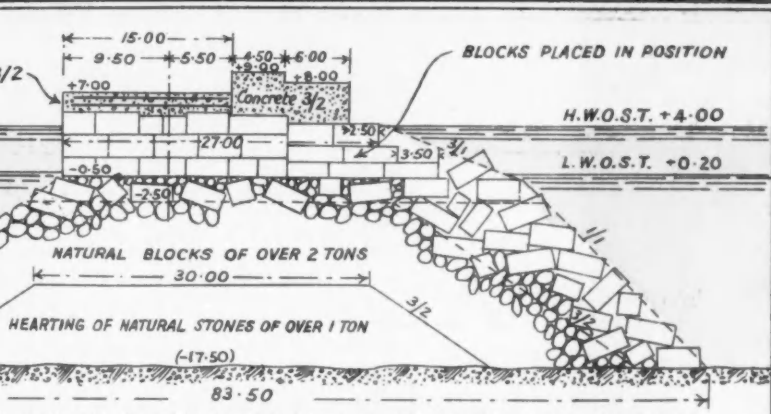

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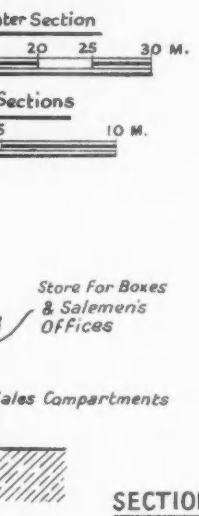
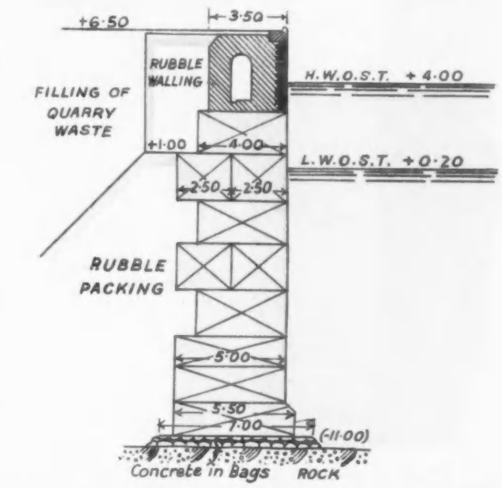
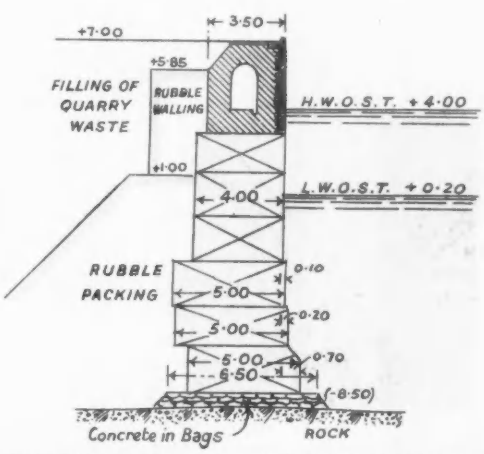
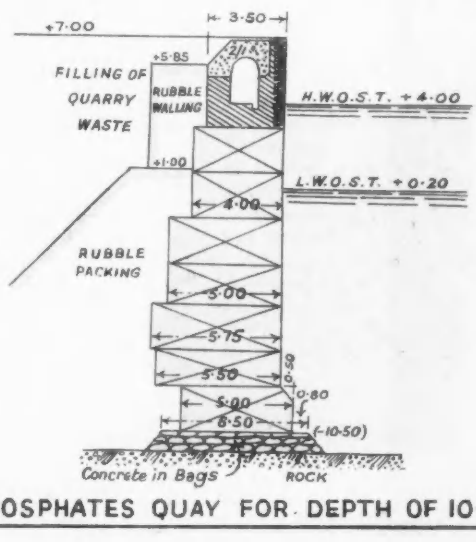




SECTION OF QUAY ALONGSIDE MAIN BREAKWATER FOR DEPTH OF 11M



PHOSPHATES QUAY FOR DEPTH OF 8·50M



PHOSPHATES QUAY FOR DEPTH OF 10·50M

The Port of Casablanca, Morocco

Recent Developments; New Fish Dock Installation

(Adapted from the French) *

A GENERAL DESCRIPTION of the Port of Casablanca having been given previously,† it will be sufficient now to recapitulate very briefly its main features and to describe more fully only such developments as have taken place in the past few years. The most recent and perhaps the most interesting of these is the creation of the new Fish Dock, of which a full description will be given after reviewing general progress.

Floating Dock.

Features of the Port

The Port of Casablanca, situated in longitude 7° 37′ West and latitude 33° 36′ North, lies in a bay only slightly sheltered between two rocky headlands, on the North-West Coast of Africa, in French Morocco and about 200 miles south-west of Gibraltar.

The greatest range of tide is 3.20m. (12½-ft.). The prevailing winds are W. and S.W. in winter and N.E. in summer, but the highest waves always come from the sector between N.W. and N. whatever the direction of the wind, and the greatest storms are usually unaccompanied by any high local wind. The waves generally break in water of depth greater than 15m. (50-ft.). Consequently there was no safe and sure shelter for shipping at Casablanca until the main breakwater was extended to depths of the same order, 17m. to 18m. (55 to 60-ft.), and to a distance well beyond the harbour entrance.

It is this main breakwater which constitutes the essential feature of the harbour. In 1933, it was given the name of the "Delure Jetty," after the Inspector-General of the "Ponts et Chaussées," to whose initiative and effort the rise of Casablanca as a great port is due. The protection of the harbour is further assured by a second breakwater, the "Transverse Jetty," between which and a spur of the main jetty, the harbour entrance has an opening of 210 m. (690-ft.).

The area enclosed comprises about 125 hectares (310 acres) of sheltered water and 75 hectares (190 acres) of land reclaimed from the sea to form quays and storage grounds.

Vessels moor either at quayside berths or anchored in the harbour, which has a depth of more than 9 metres (30-ft.) over an area of about 50 hectares (125 acres) in its Northern part and alongside the main quays, and this depth is to be extended by dredging. The bottom is mainly of rock, with patches of sand and clay.

Recent Developments and Present Condition

At the inner end of harbour lies a small basin ("Petit Port") having 8 hectares (20 acres) of water surface, but of shallow depth (0 to 5 metres below low water) the quays of which were until recently used by lighters. The completion of the Commercial Jetty, however, in addition to other important consequences, has so greatly reduced the volume of lighterage that it has enabled this Inner Basin to be devoted henceforward exclusively to the fish traffic. The arrangements made in this connection are fully described under the heading of the "New Fish Dock." It need only be said here that on the Paul Chaix Quay, which is now devoted to this traffic, the new Fish Shed, completed early in 1937, is a modern building of reinforced concrete, 130 metres long, 32 metres wide, and 10 metres in mean height, with a large public auction room and compartments for individual merchants. There is a cold store for 50 tons of fish. The adjacent quays have been adapted to these new purposes and new landing slips constructed.

The main harbour has an aggregate length of 3,450 metres (over 2 miles) of mooring quays in service. These lie along the inner side of the main—or Delure—Jetty (with depth increasing as the rock bottom shelves down) and along the Commercial and Transverse Jetties (with depths of 8 to 11 metres). Interesting features are the berths formed midway along the Delure Jetty, for liners, and at the outer end of the Transverse Jetty, for tankers, by the provision of dolphins suitably aligned.

Proposed Improvements

The existing works already described are to be supplemented, as traffic increases and funds permit, by new works, including:—

(a) Completion of the second half of the inner jetty, of which the Paul Chaix Quay (where the Fish Shed has been erected) already forms one face, by building a quay wall 475 metres long, parallel with the existing quay and 170 metres from it;

(b) Construction of another jetty, of the same width as the Commercial Jetty, in the space between the latter and the Transverse Jetty;

(c) Construction of a fuel-oil dock towards the extremity and on the outer side of the Transverse Jetty;

(d) Formation of a graving dock near the root of the main jetty.

†"The Dock and Harbour Authority," March, 1933. "The Port of Casablanca," by Georges Toutlemonde.

*This article is based upon information kindly furnished by the Public Works Department of the Moroccan Protectorate and on further particulars given in the technical journal "Réalisations," published in Casablanca.

Port of Casablanca, Morocco—*continued*

Port Operation

The working of the port is under the direction of a Chief Engineer of the "Ponts et Chaussées," assisted by a Port Manager.

Pilotage is obligatory; towage optional. The Harbourmaster and the pilots are under the control of the Chief Engineer.

The lightering and the handling of goods are undertaken by a private company, the Morocco Stevedoring Company ("Manutention Marocaine") with the exception of phosphates and coal at the Transverse Jetty and of bulk grain at the Silos, completed in 1933.

Until 1932 the operations of shipping and landing goods were effected chiefly by means of lighters and tugs, but the situation has been completely changed by the Commercial Jetty being brought into use.

While in 1932 only one-quarter of all ordinary cargo was transhipped at quayside, the proportion increased to 60% in 1933, to 93% in 1934 and still more in the two following years.

The New Fish Hall.

Of special cargoes there are phosphate, grain, oil and coal These are handled by the Companies respectively concerned and by the Chamber of Commerce, with a certain amount of independence though subject to general port regulations.

Trade

The situation of the port centrally in the coastline of French Morocco, and its well-developed connections by road and rail with the interior, attract nearly 70% in value of all the import traffic of the country. Imported goods come mainly from France and Algeria and consist of sugar, cloth, tea, foodstuffs, wines, building materials, machinery, coal, oil, etc.

Of exports about 60% pass through Casablanca and 70% of these go to France. Phosphates form a large proportion (70%) of the exports through Casablanca, other merchandise being grain, wool and hides, live stock (sheep and pigs), early vegetables, etc.

The passenger traffic is considerable, mainly with Marseilles and Bordeaux, the numbers in 1935 reaching about 120,000, or 60,000 each way, increasing in 1936 to 145,000, or over 70,000 each way, in addition to 15,000 tourists on cruise passing one or two days in Morocco.

Tonnage records of shipping and of goods are given by the tables below:—

TONNAGE OF SHIPPING (1935)

	IN		OUT		IN & OUT	
	No.	N.R.T.	No.	N.R.T.	No.	N.R.T.
In Cargo ...	1,409	2,945,311	1,774	3,330,472	3,183	6,275,783
In Ballast ...	738	1,361,582	382	991,287	1,120	2,352,869
Total (1935) ...	2,147	4,306,893	2,156	4,321,759	4,303	8,628,652
Total (1936) ...	2,175	—	2,162	—	4,337	8,942,034

TONNAGE OF GOODS (1935)

In Metric Tons

	Landed	Shipped
1. GENERAL CARGO, handled by Manutention Marocaine ...	416,277	277,071
2. BULK CARGO		
"White" Oils ...	3,799	—
"Black" Oils ...	15,317	665
Tar and Bitumen ...	4,515	—
Vegetable Oils ...	5,572	—
3. COAL		
At Coal Wharf ...	144,369	23,044
Transhipped Afloat ...	9,494	11,621
4. GRAIN from Silos ...	—	99,387
5. PHOSPHATES ...	—	1,192,982
6. FRESH WATER...	—	65,933
Totals ...	599,343	1,670,703
Total Imports and Exports ...	2,270,046	

Fishery

Fishing boats plying from Casablanca number about 130 of various kinds, manned by about 900 seamen. The value of fish landed yearly is about 10 million francs. The fish is supplied to the local market (including 12 canning and 4 salting factories), to the large towns of the interior and also to Spain, Algeria and even France.

A full account of the new development for accommodation of the fish traffic follows:—

NEW FISH DOCK

Importance of the Moroccan Fishery

The abundance and variety of fish along the coasts of Morocco are attributed to several causes. Species native to the Atlantic Ocean mingle with those of the Mediterranean. The warm temperature and an abundant supply of plankton for food furnish favourable conditions and above all there has been freedom from such intensive trawling as has denuded the waters along other coasts. In addition to those kinds which remain throughout the year there are others of migratory habit, which arrive in shoals at their proper season, such as sardines, anchovy, mackerel and tunny-fish. Inshore there are lobsters and other crustaceans in great quantities.

Prospects of Casablanca as a Fishery Port

The Morocco Protectorate has been concerned during recent years in seeking to exploit, on rational lines, this great natural wealth. Numerous small fishing harbours have sprung up along the coast, from Mehedya in the nortn down to Agadir in the south, and give shelter to fleets of trawlers and other craft, which are manned principally by men from France, Morocco, Portugal and Spain. Fedala in particular has a notably modern equipment. But of all Morocco ports, Casablanca is without doubt the most suitable for the development of fishery accommodation. It is located in close proximity to an important area of demand, having a population of nearly 260,000, of whom 80,000 are European.

From Casablanca the fish can be readily and expeditiously conveyed to the various centres of consumption in Morocco and Algeria, either by train or by motor lorry. Shipping lines provide regular transport to France and abroad.

Casablanca is likewise destined to become a refitting and supply port for the large trawlers fishing along the African coast as far as Mauretania and forsaking the European coasts which have been exhausted by over-fishing in the past. Finally, Casablanca is well provided with canning factories, specialising in the preserving of sardines.

The rapid progress of the fishing industry in Morocco and the facilities which the Port of Casablanca has to offer for its development thus afford ample justification for the generous contributions recently made by the Public Works Department towards effecting improvement in the conditions for the landing and selling of fish and providing greater facilities for the equipment and provisioning of fishing craft.

It may be interesting to indicate by comparative figures the position of Casablanca among fishing ports. The table below shows its relation to others in Europe and North Africa, as measured only by the tonnage landed in 1934, irrespective of the quality or the cash value of the fish:—

Name of Port	Tonnage of Fish Landed	Name of Port	Tonnage of Fish Landed
Boulogne	85,245	Fécamp	12,278
Ymuiden	45,000	Douarnenez	10,754
Dieppe	23,522	Arcachon	7,794
Lorient	22,825	Concarneau	7,567
Ostend	20,000	Oran	6,509
Casablanca	15,159	Lafi	4,817
La Rochelle	14,402	Fédala	2,321
La Croisic	12,665	Algiers	2,207

The number of vessels regularly landing fish at Casablanca was over 120 in January, 1937.

Old and New Accommodation

In order to cope with the ever-increasing fish trade at Casablanca, the Marine section of the Public Works Department has, for about 15 years past, devoted much attention to providing shelter for fishing boats and accommodation for the landing and sale of fish.

At first the small inner dock was allocated to this traffic, landing slips were formed and later a floating stage. In 1920 a fish shed was built for selling the catch by auction.

Before long, however, these arrangements were found inadequate; it became necessary to undertake the construction of

Port of Casablanca, Morocco

General View of the Port, showing Fish Dock in left hand lower corner.

The Grain Silos.

Port of Casablanca, Morocco—continued

Interior of Fish Hall.

other landing slips outside the small dock and to enlarge the sale shed. Nevertheless the traffic again overtook the capacity of the works and in 1934 a decision was reached to construct a proper fish dock of ample dimensions to provide for the future of the trade. The first instalment of the necessary works, now brought to conclusion, comprises the following features:—

Fish shed, with compartments for use of merchants.
Cold store.
Accommodation for use of fishermen and canners.
Quays and landing slips, for fish to be canned.
Equipment for dipping nets.
Sundry structures: Canteens, weighbridge, etc.

Fishery Harbours: General Principles

The arrangements in a port for fish traffic depend entirely upon the kind of fish landed, the method of packing and the conditions of despatch. In the ports of the North Sea, for example, which cater for the herring fishery, the arrangements are very rudimentary, especially where the fish are landed in barrels, after being salted on board, as is the case in the majority of German and Dutch ports. It is quite a different matter in ports where unsalted fish is to be sold, which it is essential to market as rapidly as possible, so that it may reach the consumer in the very freshest condition. In such ports it is requisite to have extensive areas at disposal for the display of the fish before sale, situated in convenient proximity to the loading quays. It is likewise desirable that merchants' offices should be very near to the Sale Room, the latter being approached by paved cartways or, where suitable, by railway lines.

The operations of the fishing boats have to be facilitated by placing at their disposal the necessary supplies (fuel, water, ice, etc.), places for storing their fishing gear (nets, ropes, etc.), as well as slipways and repairing yards.

The general arrangements of sale sheds for fresh fish in all countries do not differ greatly in themselves, since they have to meet the same needs everywhere. Between the face of the quay and the shed, there is usually a width of from 3 to 7 metres (10 to 23-ft.) where the boxes are dumped and handled by light cranes, although the commonest method of discharge is by the boats' own appliances.

Most fish sheds include a sale room, separated by a passageway from the merchants' rooms, over which are their offices and empty-box stores.

All these conditions have been duly observed in designing the equipment for the trade at Casablanca.

The New Fish Harbour at Casablanca

The new fish dock is located in the area known as the Little Harbour ("Petit Port") and makes use of the Paul Chaix and other existing quays. The total length of quays at which fishing boats can lie is about 260 metres, of which a length of 140 metres is in front of the Fish Shed. The depth of water alongside these quays varies from 2 metres to 4½ metres below L.W.S.T. The quays and slips lying to the south of the building are reserved for landing fish intended for preservation. The slips, three in number, are 20 metres long and 5 metres wide. The coping level of these quays is set at 4½ metres above zero, to facilitate the discharge of fish at low water, the level of lowest low water being 0.50 and that of highest high water 4 metres. The general surface level in this part of the port being 6 metres, the fish quays are approached by ramps at an inclination of 3 or 4°.

The buildings erected within the fish dock area comprise:—

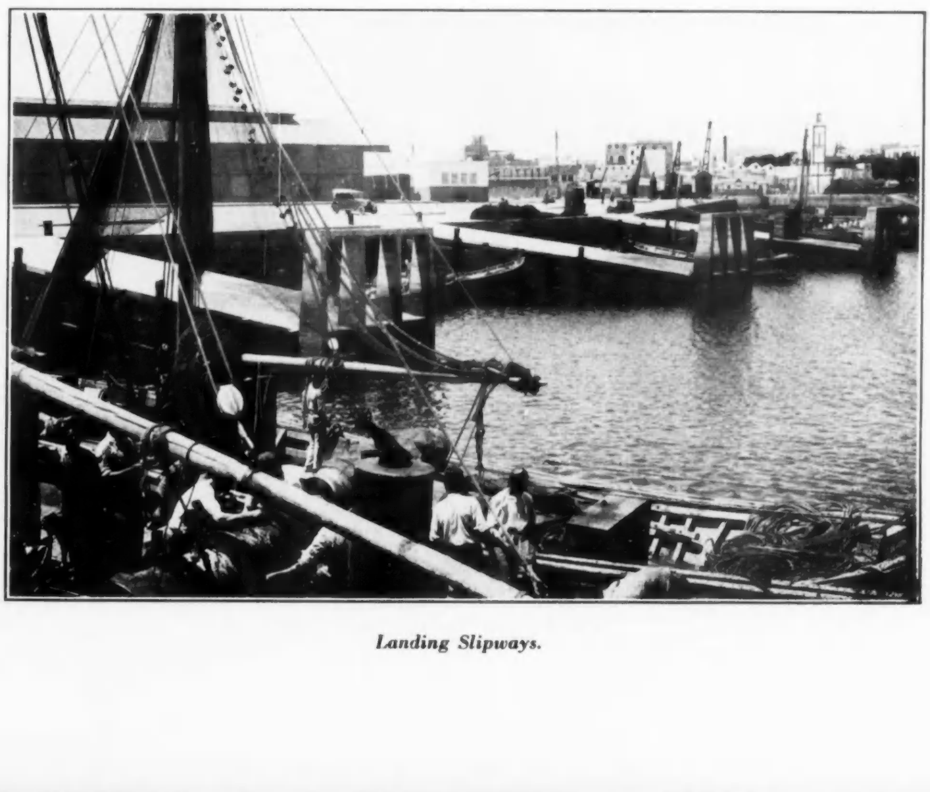
The Fish Shed ("Halle au Poisson"), of two storeys, in reinforced concrete, covering an area of 4,320 sq. metres.
A Cold Store having an area of 434 sq. metres and a capacity of 1,000 cubic metres.
Sixty units of accommodation for fishermen, merchants and canners, contrived in old sheds Nos. 7 and 15 and covering a total area of 4,200 sq. metres.
A net-dipping plant of an area of 600 sq. metres, including drying equipment.
Mess Rooms for Europeans and natives respectively.
A 10-ton automatic weighbridge and weigh-house.
Road access to the Fish Dock is provided by a dual carriageway, with continuous central refuge, in extension of an existing boulevard.

The Fish Shed

The fish shed ("Halle au Poisson") has been created on the Paul Chaix Quay, which is a solid mole 200 metres long and 90 metres wide. The general arrangements have been made to suit the conditions imposed by the operations of landing and distribution of the fish. These conditions are as follows:—

On arrival of fishing craft alongside the shed quay, the fish, which has been kept in ice on board, is packed in boxes and landed on the quay. This is done by manual labour, as no real advantage is found in employing mechanical handling appliances.

If the tide is high, the deck of the vessel rides at about quay level and there is no difficulty in the operation, but at low water, especially of spring tides, means must be taken to overcome the difference of level. In this case the fishermen employ platforms fixed upon movable racks, of which the level can be adjusted according to the tide. One man stands on the platform



Landing Slipways.

Port of Casablanca, Morocco

Part of the Commercial Jetty.

Blockyard.

Port of Casablanca, Morocco—continued

and puts on to the quay, or into the hands of another fisherman, each box of fish as it is passed up to him from the boat. Several of the platforms can be ranged side by side, at different levels, so as to form a sort of stairway.

The fish thus landed in boxes is displayed in a Sale Room, where it is sold by auction to merchants, whose individual premises are located near it.

In the merchants' premises the fish is washed, sorted and placed in other boxes ready to be loaded direct into railway wagon or lorry, or to be deposited in cold storage.

The shed comprises two distinct divisions: the Sale Room and the range of merchants' compartments, separated by a covered way, 6.65 metres (22-ft.) wide. These two divisions of the building, both of two storeys, have the same overall dimensions, 130 metres by 12.85 metres (426-ft. by 42-ft.) and are constructed with rigid "portal" frames of reinforced concrete, carrying floors of the same material. The upper floor is designed to carry a load of 500 kg. per sq. metre or about 1 cwt. per sq. ft. Each division is cut in four equal parts by three expansion joints with twin frames at the joints. The frames are designed as portals with hinges at the base of the legs but above ground

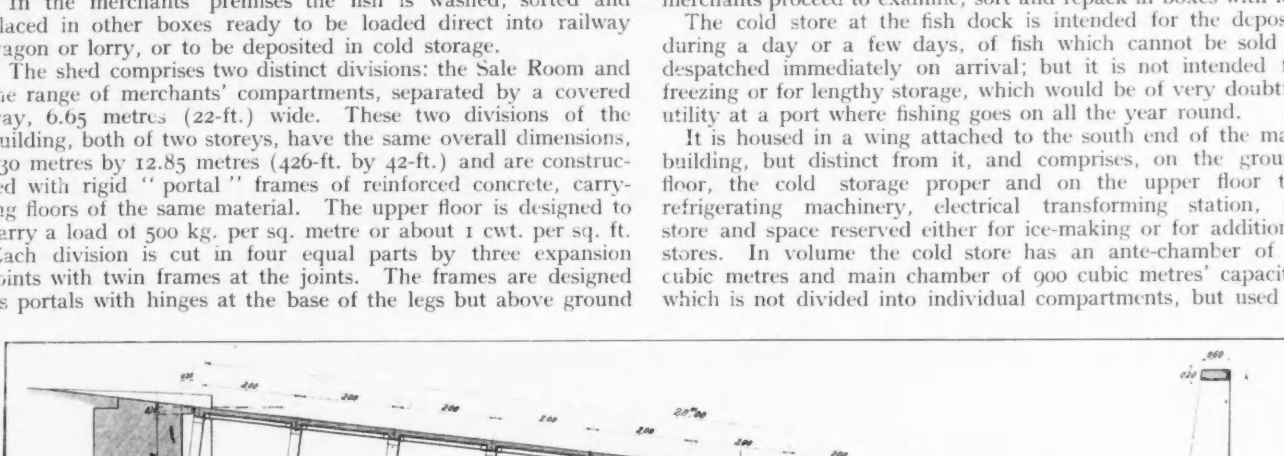
The Cold Store

On fishing boats the catch is generally kept fresh by covering every layer with finely-broken ice. The time passed at sea is very variable, not exceeding one day for the smallest boats, but it may reach 6 to 8 days for the larger craft, which fish on the shores of Southern Morocco and Mauretania.

At auction the fish is displayed without ice, but after sale the merchants proceed to examine, sort and repack in boxes with ice.

The cold store at the fish dock is intended for the deposit, during a day or a few days, of fish which cannot be sold or despatched immediately on arrival; but it is not intended for freezing or for lengthy storage, which would be of very doubtful utility at a port where fishing goes on all the year round.

It is housed in a wing attached to the south end of the main building, but distinct from it, and comprises, on the ground floor, the cold storage proper and on the upper floor the refrigerating machinery, electrical transforming station, ice store and space reserved either for ice-making or for additional stores. In volume the cold store has an ante-chamber of 90 cubic metres and main chamber of 900 cubic metres' capacity which is not divided into individual compartments, but used in



LANDING SLIPWAY

MEASUREMENTS SHOWN IN METRES

level and rest upon separate sole-plates calculated to give a maximum load of 1 kg. per sq. cm., or 1 ton per sq. ft., on the ground, which consists of old filling of hard material, capable of bearing this load without appreciable settlement. To counteract any outward pressure behind the quay wall from the thrust of the portals, anchor bars of reinforced concrete are formed at foundation level.

The central passageway is covered by a flat roof, embodying a series of lantern lights and carried by small portal frames, three-hinged to allow of slight relative movement, the whole being in reinforced concrete.

The Sale Room floor has a slight gradient to facilitate cleaning; it is divided by the portal frames into 18 bays, which are further divided into squares by painted bands, so that every square can be designated by its number and the letter of the bay, and moveable barriers (lifting or rolling) are provided for use as required. There is a counting-house at the south end and a stairway at each end of the building giving access to the upper storey. This upper floor is pierced with a central row of openings to give light and ventilation to the Sale Room below, also affording means of observation and oversight of the sales. The upper storey is unglazed, the ventilators being so formed as to pass light as well as air, and there are projecting canopies for exclusion of the direct rays of the sun in summer.

The side of the building which accommodates the merchants, comprises, on the ground floor, a transit area giving access to the cold store, 14 compartments appropriated to individual merchants, each of 90 sq. metres, and a double compartment (180 sq. metres), furnished with means for the washing of fish by merchants in a small way of business, who have no individual allotment of space.

Each individual compartment has two troughs for fish washing (with fresh and salt water respectively), a system of overhead runways (for the transport of boxes of fish to the cold store and for picking up crushed ice by grab), a spiral staircase and a hand-operated box-lift to the upper floor.

On the upper floor there are 14 merchants' offices, over their respective rooms, and at either end of the building there are general offices over the transit area at the south end and a restaurant over the washing room at the north.

The sea-water used for washing, amounting to 15 cubic metres (3,000 gallons) per hour, is drawn from the harbour, but is subjected to a very complete treatment for purification, by decantation, precipitation, filtration and finally a form of chlorination, before use.

common by all. This method utilises the space most rationally and economically, at least until the requirements of the trade become more clearly defined. Moreover merchants can employ small cold chambers, of 30 cubic metres capacity, within their own premises.

Passing in and out of storage the boxes are not handled singly but in batches of 24, stacked in metal cages slung from overhead runways. This greatly facilitates transit and also ensures effective refrigeration. The total capacity of the main chamber amounts to 160 cages or about 50 tons of fish. Enlargement can be made if and when required. The system of refrigeration adopted is that of ammonia compression and cold air circulation. The insulation is effected by cork slabs; the exterior walls are of brickwork, mostly hollow. The ice store, of 30 tons capacity, receives supplies from factories in the town, but the ice is crushed on the premises and conveyed in tipping skips by overhead runways where required for use.

Fish Landing Stages

The landing stages or slips, for the service mainly of sardine boats, are not solid, but each is formed of two tubular girders of vibrated reinforced concrete, 20 metres long and 2 metres square, connected by a slab 1 metre wide, giving a total width of 5 metres. They have a slope of 1.10 metres, the outer ends resting on concrete piers, which are carried up vertically to mark their position when the slipways are submerged. At high water the boats lie alongside the quay wall in the spaces between the sloping stages.

Gear and Net Stores, etc.

For the storage of fishing gear and nets and for box preparation and other similar operations, the erection of new buildings was not thought necessary, but existing sheds, Nos. 7 and 15, have been adapted for these purposes, being divided into about 60 individual lettings. Plant has also been provided for the dyeing or dipping of nets, which is necessary for their preservation. This is installed in a new building of reinforced concrete.

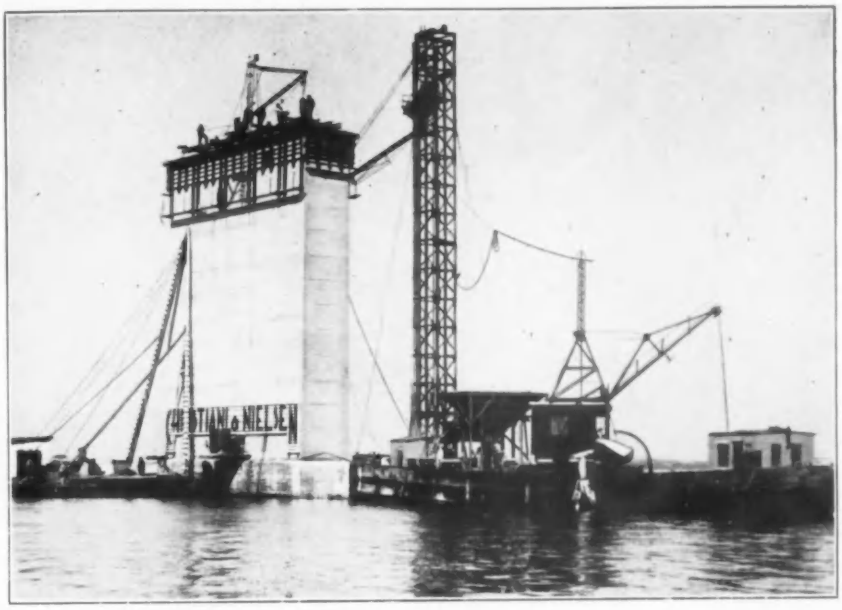
The 10-ton weighbridge already mentioned, with recording apparatus, is used mainly for weighing fish intended for preservation, as it leaves the port for the canning factories.

From the foregoing account it will be seen that the Port of Casablanca is keeping pace with the requirements of modern trade. The future, too, is kept in sight by reserving space for additional works, as may prove necessary.

The Storstrom Viaduct

Novel Method of Constructing Piers in a Navigable Waterway

The birthday (September 26th) of His Majesty King Christian of Denmark has been marked by a constructional event of notable importance. On that date was opened a new viaduct, or bridge, across the Storstrom, a branch of the sea between the islands of Seeland and Falster. With a length of 10,535-ft. between extreme abutments, it is the longest bridge in Europe across open water. The structure accommodates a single-track railway and a roadway 18½-ft. wide, with a side track 8¼-ft. wide, for cyclists and pedestrians. As a railway connection between the two islands, the former of which contains the capital and port of Copenhagen, the bridge is an important link in the Scandinavian system and it has been constructed for the Danish State Railways.



Pier nearing Completion.

As will be seen in the view on page 340, the bridge consists of 50 spans, 47 of which have a uniform width of about 200-ft. The three central spans across the main navigable channel are of larger dimensions, viz., 336-ft., 448-ft. and 336-ft. respectively. The spans are shown in clearer detail in the enlarged view on the same page. The headroom above water level to the underside of the bridge is 85-ft., which suffices to give ample clearance for the masts of shipping using the waterway.

The depth of water in the Storstrom is from 20 to 40-ft. The bottom consists of clay partly mixed with sand, which in itself offers no particular difficulties for foundation work. The crucial problem was to devise a method of construction by which the large number of 51 piers could be completed within the time limit of 2½ years assigned for the work.

The erection of the piers in the ordinary way within dams of lofty sheet piling would have required so much material and involved so much labour that the idea was found to be impracticable. An entirely new system was adopted in the form of movable steel cofferdams of uniform dimensions, so as to be utilised repeatedly in successive positions. These cofferdams, or "units" as they were termed, consisted of steel rings, oval in shape, open at the top and bottom, having double plated walls forming watertight compartments, by which the units could be floated or lowered into position with the aid of water ballast. The interior of the unit was free from obstruction of any kind all the bracing and stiffening pieces being in the space between the outer and inner walls.

The sequence of operations and the method of placing and removing the units can be followed from the series of diagrams shown below. The unit was first towed into position at the site of a pier and sunk by water ballast so as to cause it to rest along its lower edge on a series of short piles driven in advance of the work. The outer wall of the unit corresponded with the profile of the pier base, and along this periphery a ring of sheet piling, previously suspended from the unit, was driven into the ground by a piling machine carried on the unit.

The joint between the piling and the unit was secured and made tight by the insertion of wood blocks into the hollows of the sheet piling at the upper ends, the blocks being forced by external water pressure against wooden strips on the unit when the latter was pumped free from water. When this had been done excavation for the base and the deposition of concrete could take place in the open. Concreting was continued up to a level of 10-ft. below water surface level, at which point the work was arrested while the unit was raised and towed to another position. To effect this, the unit was first filled with water to counteract the external water pressure, next, it was balanced in the water by pumping out the water ballast from the compartments. Then it was lifted free of the sheet piling and concrete by jacks and finally tilted on one side by a re-admission of water to certain compartments, so that the higher edge of the unit could just slip over the top of the concrete.

The lower portion of the work being completed, the next step was the placing thereon of a special caisson consisting of a ring of reinforced concrete, pre-cast on a slipway on shore and towed out into position suspended between two barges, so raising the level of the pier to 8-ft. above water level. This part of the pier is faced with granite. Thereafter the building of the pier was

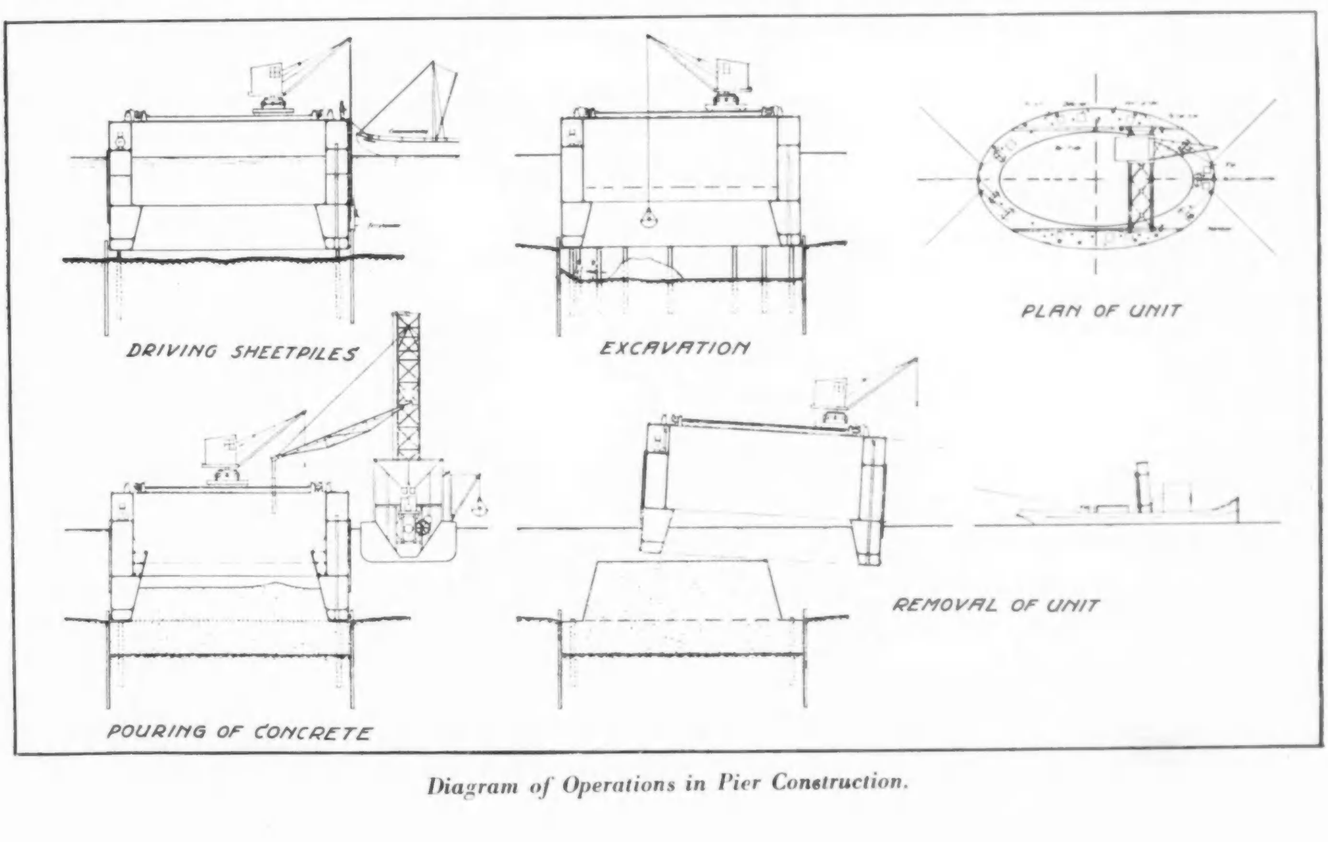
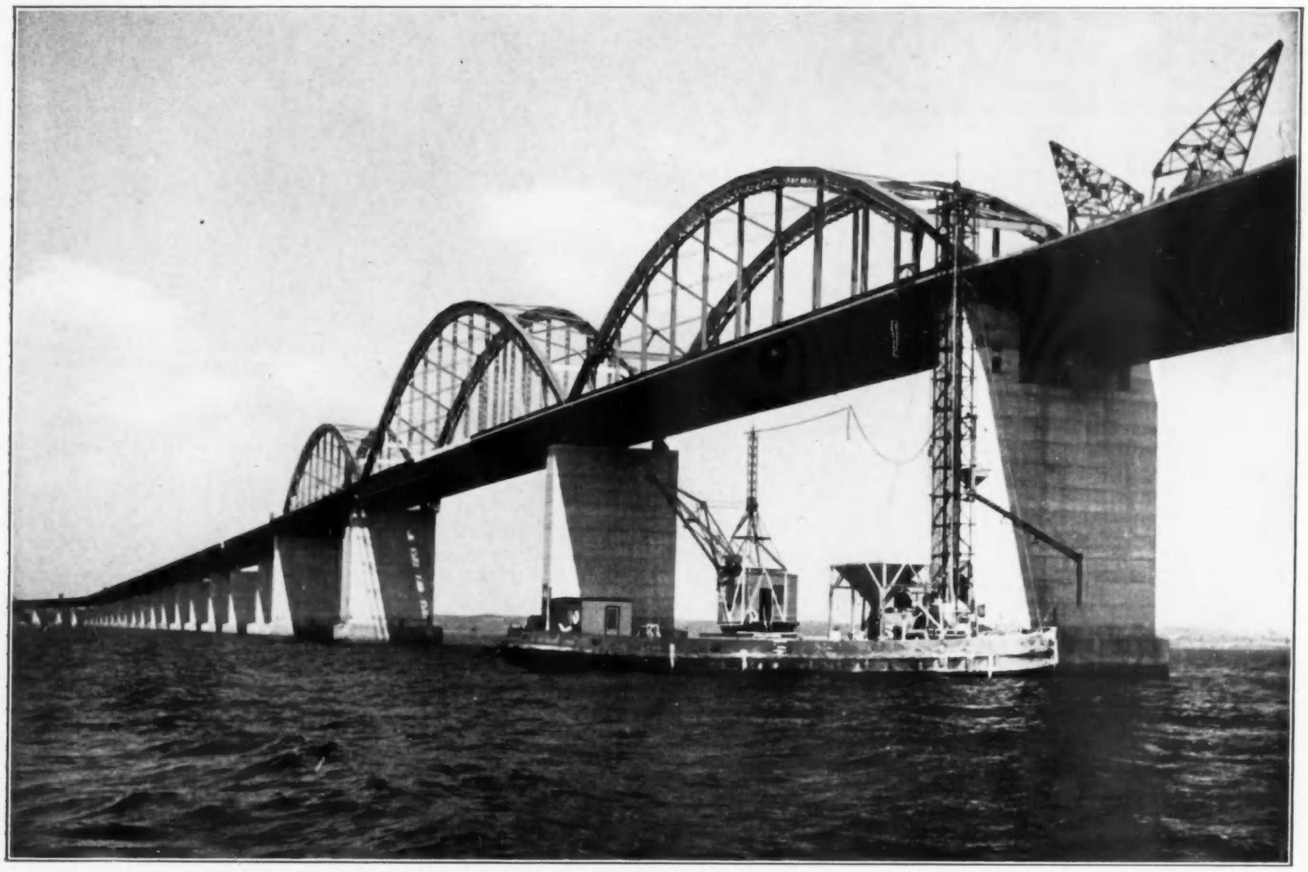


Diagram of Operations in Pier Construction.

The Storstrom Viaduct



View of the Central Navigation Spans.

General View of the Storstrom Bridge, Denmark.

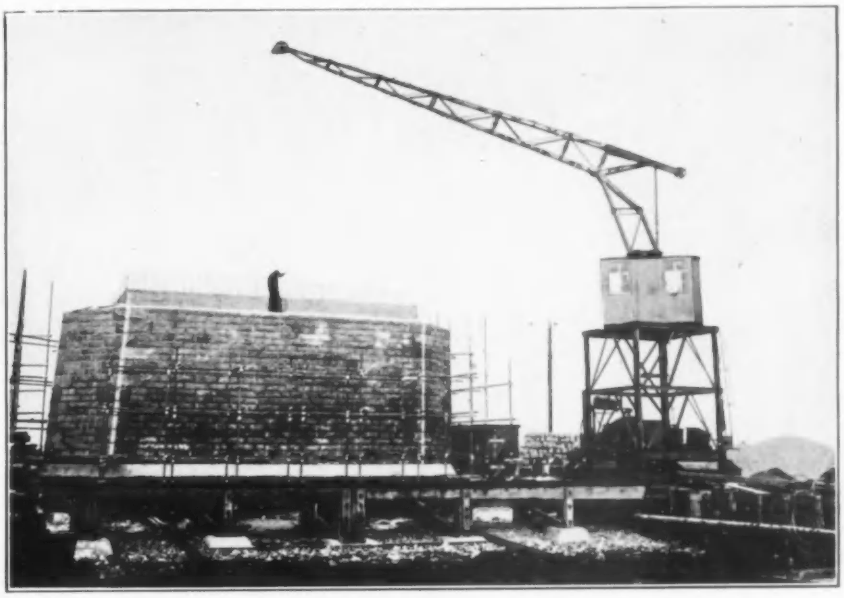
The Storstrom Viaduct—continued

continued in the open with plain concrete within sliding shuttering.

In some cases, the foundation soil was not sufficiently sound to admit of the unit being pumped out without the use of sheet piling of excessive length. Another type of unit was used to overcome this difficulty, by which the excavation was done by a grab and the concrete deposited under water through pipes 10-in. in diameter.

The steel structure of the bridge proper, though not a feature of essential interest from the maritime point of view, was nevertheless notable in regard to the method of its erection, which involved the use of a specially-constructed floating crane. The steelwork was manufactured in England and sent out in lengths of from 39-ft. to 46-ft. by sea to Masnedo, on a small island contiguous to Seeland, where a temporary harbour was located with an erection yard. Here the various spans were assembled and rolled along two parallel slipways for a distance of 130-ft. out from the shore.

The spans were lifted in turn by the floating crane, towed out into position between the supporting piers and lowered on to their bearings.



Building of Pre-cast Caisson on Slipway (reinforced concrete faced with granite).

The crane, which was designed by Messrs. Dorman, Long and Co., and built by Messrs. Burmeister and Wain, of Copenhagen, had a lifting capacity of 500 tons and is considered to be the largest floating crane in existence. It was mounted on two barges, each 164-ft. long by 26-ft. wide, with a structural steel tower 150-ft. high, the top of which was cantilevered out and carried tackle with nine steel sheave-blocks. Each tackle had a special girder to which the span was attached. The hoisting winches, supplied by Messrs. Stothert and Pitt, were steam-driven from boilers on the deck of the barges.

The foundation work and construction of the piers was carried out with five months of the contract time to spare, by Messrs. Christiani and Nielsen, to whom we are indebted for the diagrams and illustrations. Messrs. Dorman Long and Co. were the main contractors for the undertaking and supplied all the bridge material amounting to over 20,000 tons of steel.

Including a smaller bridge over the Masnedsund the total cost of the undertaking was about £1,300,000.

Excerpts from the Annual Report of the Bluff Harbour Board, New Zealand, for the Year ended 30th September, 1936

Secretary, Treasurer and Chief Executive Officer's Report

Receipts.—The total cash receipts of the Board for the year ended 30th September, 1936, amounted to £45,674 13s. 5d. as compared with £43,231 7s. 7d. for 1935, but off this latter total must be taken £750 received from the sale of plant giving a net total of £42,481 7s. 7d. or an increase for this year of £3,193 5s. 10d.

There is a very large increase in wharfage dues while berthage dues, pilotage and towage fees, and water account show a decrease and port charges just £9 more than 1935. In the past wharfage dues and ships charges have run each other fairly close, but this year the reduction of 5/- per ton on outward cargo under the tonnage basis by-law for overseas vessels with small cargoes, has been reflected in the receipts from ships' charges, which would otherwise have shown a considerable increase, proportionate to that of wharfage dues.

In the income and expenditure account, the income for the year is £45,246 18s. 9d. and the expenditure £27,758 14s. 9d. and after allowing £8,558 0s. 9d. for depreciation, the result of the year's operations is a net profit of £8,930 3s. 3d.

Shipping Return.—The return of shipping as submitted by the Harbourmaster, Capt. N. B. Haszard, for the twelve months ended 30/9/1936, shows an increase in the number of vessels working the port and an increase in the tonnage when compared with the previous year.

In 1936 the totals were 499 vessels of 584,392 tons net register; 1935 totals were 491 vessels of 542,763 tons net register.

During the year 35 vessels 500-ft. in length or over visited the port and the Board's pilots piloted 65 vessels in and 67 vessels out.

Trade of the Port.—The tonnage of cargo handled over the Board's wharves for the twelve months ended 30th September, 1936, was:—Imports, 74,163 tons; exports, 81,746 tons.—Total—155,909 tons.

As compared with last year there is an increase in coastal imports of 5,596 tons and an increase in overseas imports of 7,278 tons or a total increase in imports of 12,874 tons.

There is an increase in coastal exports of 955 tons while overseas exports are down by 1,879 tons or a total decrease in exports of 924 tons.

A summary as compared with 1935 year shows the total trade position as follows:—

Coastal imports increase, 5,596 tons; coastal exports increase, 955 tons. Increase, 6,551 tons.

Overseas imports increase, 7,278 tons; overseas exports increase, 1,879 tons. Increase, 5,399 tons. Total trade increase, 11,950 tons.

The value of the exports through the Port of Bluff for the year was £3,116,052 as against £2,639,063 for the previous year, or an increase of £476,989.

The value of imports through Bluff also showed an increase as compared with the previous year being £702,914 in 1936 and £652,231 in 1935.

The value figures are as supplied by the Government statistician for the years ended 31st December and are in terms of New Zealand currency.

The Report was signed by Mr. R. N. Porter, A.C.S.N.Z., Secretary, Treasurer and Chief Executive Officer.

Engineer's Report

Reclamation.—Last year, the Board decided to reclaim to finished level an area of approximately 2 acres at the eastern end of the area. During the year 12,458 cubic yards of material were pumped into the area and the 2-acre block was completed. The block was then covered with clay and soil and sown down in grass. Temporary arrangements were made for draining storm water from the locality pending the completion of the whole reclamation. At the request of the District Engineer, N.Z. Railways, the temporary culverts and pipe lines were removed and the permanent way restored.

Main Wharf.—The major operations on the main wharf during the financial year consisted of the following work:—

(1) Renewal of defective decking and beams.
(2) Strengthening of mooring piles and installation of cast iron bollards.
(3) Installation of additional siding to No. 1 berth.
(4) Reconditioning of Eastern Approach.
(5) Renewal of braces and walings in No. 1 berth.
(6) Flush-decking a portion of the wharf between Nos. 1 and 2 berths and flush-decking points and crossings.

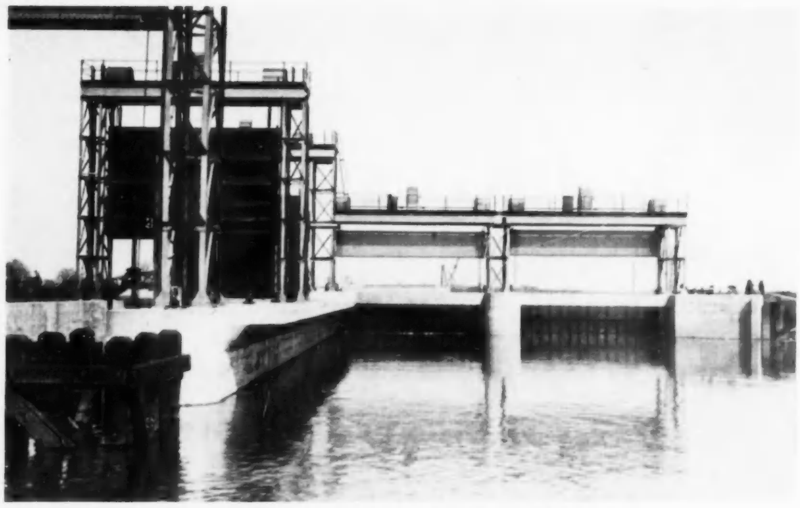
Railway Facilities, No. 1 Berth.—In order to improve the lay-out of the railway tracks on the wharf and so facilitate cargo handling operations, an additional siding was constructed to No. 1 berth. This siding obviated the necessity of clearing No. 3 road in No. 2 berth when shunting operations to feed Nos. 1 and 2 roads for No. 1 berth were being carried out. A new double slip and an extra turn-out were installed and a re-arrangement of the layout in this area was effected. Prior to laying the rails, the decking beams were renewed where necessary. Electric light poles were shifted to new positions and on completion a great improvement was observed.

The Report was signed by D. E. S. Mason, Assoc.M.Inst.C.E., Engineer to the Board.

River Nene Catchment Board

Dog-in-a-Doublet Lock and Sluices

By HAROLD W. CLARK, Engineer to the Board



Dog-in-a-Doublet Sluices and Lock from upstream.

River Nene Improvement

An important part of the comprehensive improvement scheme on the River Nene is the correction of the river channel by widening and regrading below Peterborough. The main obstacle to this was a high shoal of hard gravel, known as the Northey Gravels, situated about 2 miles below the town. Schemes have been prepared for the removal of this shoal in the past, but it was held that its retention was necessary to preserve the fresh water from the River Nene to Thorney by acting as a weir, retaining fresh water upstream and impeding the flow of brackish water from the sea. A perpetual injunction was obtained in 1865, which prohibited the removal of the Gravels.

To enable the improvement of the river channel to be carried out and to preserve the water supply to Thorney when the Northey Gravels were removed, the Dog-in-a-Doublet sluices and lock were constructed. The new structure is now the limit of the tidal length; formerly, the river flowed freely for the 30 miles from Peterborough to the sea with a tidal effect giving a variation of about 18-in. on spring tides at Peterborough.

Foundation Slab for Lock in position, April, 1936.

The New Works at Dog-in-a-Doublet

The new structure comprises two 30-ft. sluice-ways for the discharge of fresh water and a lock for navigation. The sluice-ways are installed on the south side of the lock and are separated by a reinforced concrete pier 32-ft. 6-in. long by 7-ft wide. The cill is laid at —3.00, O.D., and the reinforced concrete foundations are 9-ft. thick. The sluice gates are 17-ft. deep and seal on the lintel of a reinforced concrete bulkhead 3-ft. deep, between the piers. On the downstream side of the sluices, there is a dished concrete apron, with an average thickness of 6-ft., and 80-ft. long, continued in order to prevent scouring action, with brushwood mattress protection weighted with half-a-ton of granite per square yard. Mattress protection is also provided above the sluices.

The Nene Catchment Board are the navigation authority on the whole length of River Nene, with the exception of the lower reaches near Wisbech, and it was necessary to make provision for navigation at Dog-in-the-Doublet, therefore a lock was included in the structure.

The Lock

Owing to the reduced summer flow of the river and the necessity to conserve water for the Thorney supply, the dimensions for the lock required consideration. A vessel 133-ft. long by 22-ft. wide by 9-ft. draft (laden) was taken as a standard, and a 100-tons canal craft 78-ft. long by 14-ft. 6-in. wide by 4-ft. 6-in. draft (forty-four other locks on the river are in course of reconstruction to take a barge of these dimensions) was taken as the smaller unit which in the future would use the lock. The tidal range at the sluice when the improvement works on the river are completed will be between —3.00, O.D. and + 10.00, O.D. The normal retention level above the sluice is + 9.5, O.D., but this upstream level will rise during floods and fall during drought periods. Thus, the conditions for passing navigation may be reversed, and, in addition, the dimensions of the standard vessel are not a multiple of those of a barge. After investigation, it was decided that the most economical method would be to sub-divide the lock, so an intermediate gate was introduced to give an 88-ft. length of lock pen. The dimensions of the lock are 145-ft. long by 26-ft. wide, with an intermediate length of 88-ft. The downstream cill is laid at —6.00, O.D. and the upstream cill at —3.00, O.D. The coping level at the downstream end is + 17.00, O.D. falling to + 15.00, O.D. along the lock.

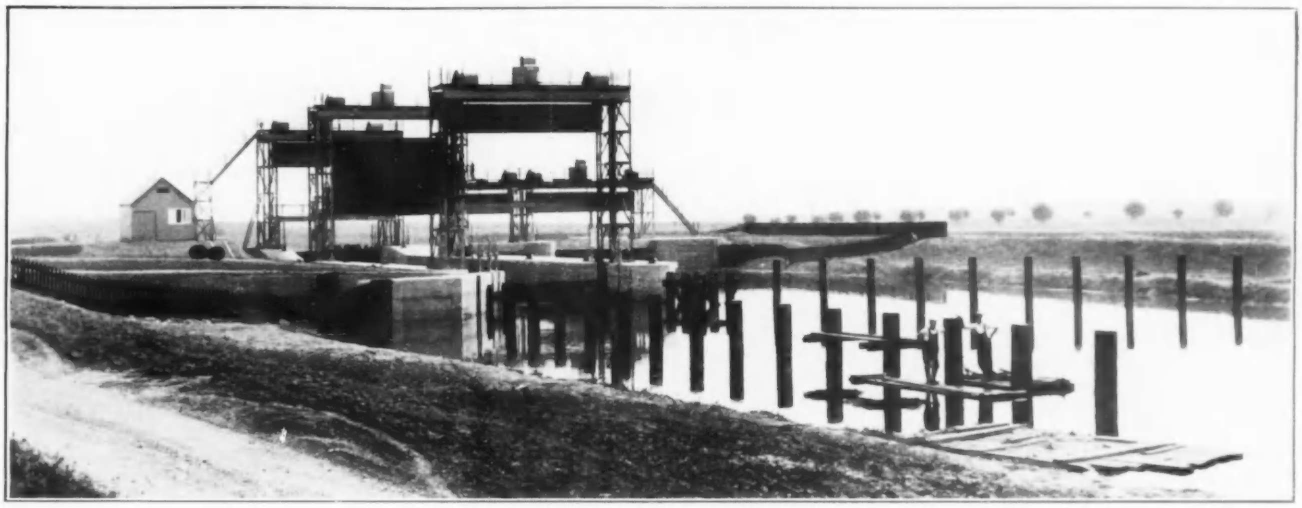
In view of the possible variation in upstream water level, six pairs of double leaf pointing gates would have been required to pass navigation under all conditions. For this reason, vertical lifting lock gates were used. The use of these gates resulted in a considerable economy in cost, by reason of the fact that the length of the lock was shortened by at least 35-ft.

The Gates

The three lock gates have a clear span of 26-ft., and in the fully-raised position give a clearance of 15-ft. above water level. Two of the gates have their cill at —6.00, O.D. and one at the level —3.00, O.D., the depths of the gates being 22-ft., 18-ft. and 15-ft. respectively. Each gate structure consists of a mild steel plate suitably stiffened on the upstream side by horizontal rolled steel girders. The horizontal girders are rigidly cleated to vertical end members, and are arranged to carry the steel axles for the rollers. The gates are designed to staunch under-water pressure acting from either side. The side staunching members consist of round mild steel rubber-covered rods, freely suspended and arranged so that the pressure of water forces the rods automatically to form a seal with the machined surfaces on the gate and sluice framing. The cill staunching consists of rubber strips, connected to the bottom

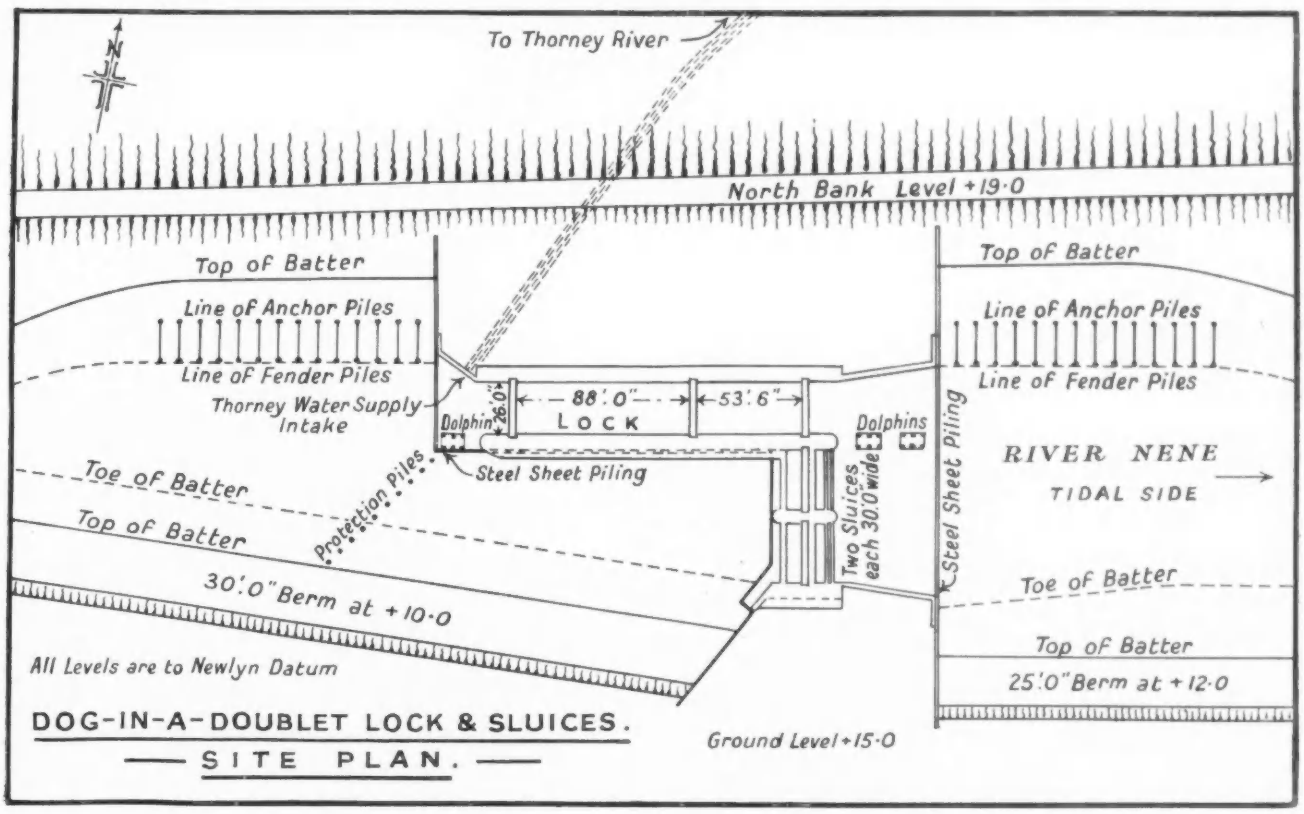
Dog-in-a-Doublet Sluices and Lock, June, 1936.

Dog-in-a-Doublet Lock and Sluices



View of Lock and Sluice from Upstream.

View of Lock and Sluice from Downstream.



Dog-in-a-Doublet Lock and Sluices—continued

edges of the gates by means of mild steel bars and bolts arranged to bear upon the cill member.

Each gate is suspended at its end from the winding barrel by wire ropes and the weight of the gates is counter-balanced by means of a mild steel box containing ballast filling.

Dog-in-a-Doublet Sluice Mattress Protection being towed to sluices.

Operating Gear

The operating gear for each lock gate consists of a central crab connected by a cross shaft to the end crabs containing the rope barrel and spur reduction gear. The gates are operated by 8 h.p. electric motors contained in the central crabs, while hand gear is provided suitable for operation by one man in the event of failure of electric current or similar emergency. The speed of lifting or lowering each of the gates by power is 8-ft. per minute. A cut-out switch is fitted in each central crab and so arranged that the motor cannot be set in motion when the hand crank is in position on the shaft. Limit switches are provided to prevent the gate over-running at either end of its travel.

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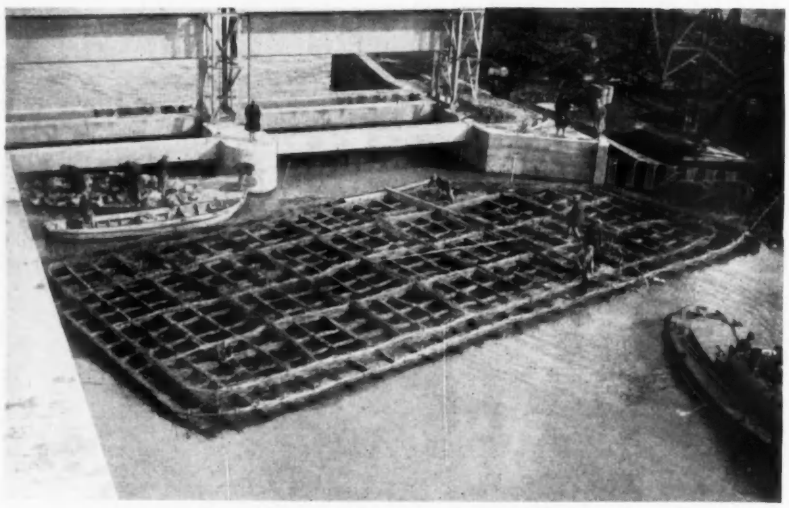
The design of the gearing incorporates a self-sustaining brake so as to provide means for keeping the gate suspended in any desired position when current to the motor is cut off or when the hand crank is removed or released.

The lock and sluice gates which were designed and manufactured by Messrs. Ransomes and Rapier, Ltd., London and Ipswich, are controlled from a panel situated in the cabin adjacent to the lock, but provision has been made for operation of each gate from the super-structure, if necessary.



Shaped Mattress Protection before sinking.

The lock is filled and emptied through 24-in. diameter Stanton-spun concrete pipes laid each side along the bottom of the lock walls, provided with 12-in. connection and 15-in. bell-mouths leading to the lock pen. As the head may be reversed, provision is made for filling the lock from either upstream or downstream. The entry and discharge of water is controlled by penstocks at each end of the lock and the intermediate 88-ft. length is controlled by sluice valves in the main feed pipes.

The contract stipulated that an adequate river channel must be maintained while the works were being constructed in order to provide for floods. To avoid building half the structure at a time, the contractors, the Dredging and Construction Co., Ltd., London and King's Lynn, diverted the river by excavating a new channel around the site. The length of the diversion was 400 yards, and on completion of the works it was filled with spoil pumped from the dredging scheme.

Foundations

At the site normal ground level is + 10.00, O.D. and borings revealed firm gravel at —12.00, O.D., and clay at —21.00, O.D. The excavation for the foundations was taken out to —12.00, O.D. The whole structure, including the concrete apron below the sluice, is surrounded by No. 2 Larssen steel sheet piling, driven 3-ft. into the clay. The heads of these piles are enclosed in a concrete lip extending around the outer walls of the structure. One 5-in. portable petrol-driven centrifugal pump was sufficient to keep the site dry.

The concrete foundation extends from —12.00, O.D. to —6.00, O.D. at the downstream cill and to —3.00, O.D. at the upstream cill. It is reinforced by $\frac{3}{4}$-in. and $\frac{1}{2}$-in. bars at the top and bottom. The south wall of the lock is 181-ft. long by 23-ft. high, and 8-ft. wide. The wall is reinforced as a cantilever, and at the coping level the decking is cantilevered to give a width of 12-ft.

Wing Walls

The wing walls are in reinforced concrete, and are 29-ft. high above foundation level. Their stems rise 23-ft. and taper in thickness from 4-ft. at the bottom to 2-ft. at the top. There are no expansion joints in the structure, but at pre-arranged points, gaps tapering in width from 4-ft. to 3-ft. through the thickness of the members were left in the floor and aprons, and were not filled in until at least four weeks had elapsed from the time of placing the concrete on both sides of the gaps.

Concrete Work

The concrete was placed through chutes fed by mixers supported on staging set at normal ground level.

The aggregate was sand passing a $\frac{1}{8}$-in. screen and retained on a 25-mesh screen and gravel between $\frac{1}{8}$-in. and $\frac{3}{4}$-in. This was mixed in the portions of $13\frac{1}{2}$ cubic feet of sand to 27 cubic feet of gravel with appropriate weights of rapid hardening Portland cement (Ferrocrete). In the walls of the lock the weight of cement in one batch was 5 cwt.; in the aprons either 4 cwt. or 5 cwt. were used; and in special work around the valve chambers and in the reinforced beams the weight used was 6 cwt. per batch.

The works were commenced at the end of August, 1935, and the contractors carried out their contract under difficult conditions, as in flood periods the site was practically surrounded by water. The works were formally opened on completion in July 1937, by the Right Hon. W. S. Morrison, M.C., K.C., M.P., the Minister of Agriculture and Fisheries.

River Wear Commission

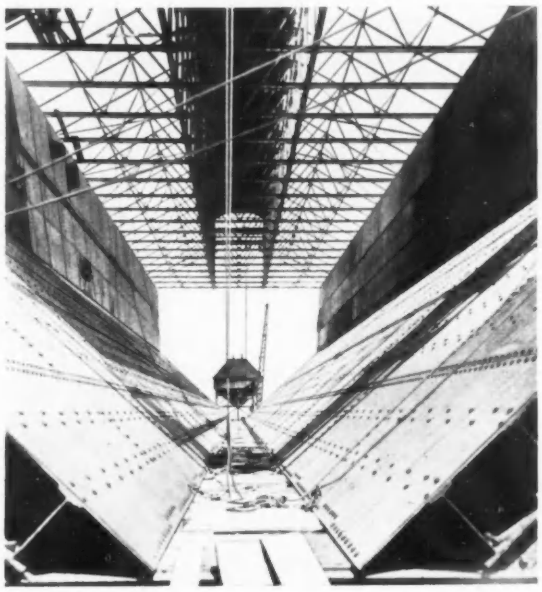
Important modifications have been made in the representation of the Sunderland Corporation on the River Wear Commission in regard to the administration of the port. A Bill is to be promoted in the next session of Parliament to give the Corporation a representative membership of 14, and in addition 2 co-opted members, making a total of 16 members on the whole Board of 37. A further proposal has been adopted that the River Wear Commission should institute a commercial department under the control of the General Manager, to be concerned with the conservation and expansion of the trade of the port.

The Handling and Ship-loading of Phosphates in Exposed Situations

Installations at Nauru and Ocean Island in the Central Pacific

In the May issue of this Journal a brief resumé was given of a Paper by Mr. Colin Howard on Phosphate Handling in the Central Pacific. Messrs. Henry Simon, Ltd., who supplied the plant, have furnished the following detailed description which affords many interesting particulars of a ship-loading installation on unusual lines to meet circumstances of a peculiar and difficult character.

I—The Plant at Nauru



12,000-ton Shore Storage Bin during erection showing form of construction.

NAURU is situated in the Central Pacific and lies about 500 miles N.N.E. of the Solomon Islands and about 2,000 miles from Sydney. In area it is about 5,400 acres.

The island is of raised altered coral formation, a deep stratum of which has been phosphatized by the action of the weather and sea-water on vast quantities of guano, and has been rendered a particularly valuable fertilizer. The phosphate deposits are vast and are probably the richest in the world.

In order that guano may be solidified under pressure and the phosphate separated out by the action of the sea-water, it is necessary for islands of this type to be subject to submergence and emergence. There is every reason to believe that Nauru has been sunk and raised more than once by volcanic action.

The phosphate, which is interspersed with coral rock, is found underneath about 1-ft. of top soil which is also rich in phosphate. The deposits have an average depth of 30-ft. and are in the form of large pockets between pinnacles of coral rock.

The island is of an unusual formation rising steeply from the foreshore to a height of about 250-ft. The reef extends about 400-ft. from the margin of the beach and is almost level along the shore line. From its seaward edge, the rock dips sharply into very deep water. It is believed that the reef overhangs and that the island is roughly the shape of a huge mushroom. The range of tide is 6-ft., and at low water in quiet weather, the edge of the reef is just awash and the reef itself dry. The very strong undertow, and the fact that there is no natural harbour or anchorage renders it most dangerous for ships to lie near the reef for any length of time.

The weather is another factor which frequently proves a hindrance. From the middle of March until about the middle of November, the prevailing wind is light and easterly, and during this period the sea is usually calm, although sudden changes do occur. Strong westerly winds rise, but although seldom of long duration they have been estimated to attain a velocity of 60 miles per hour. During the remaining months, south-westerly to north-easterly winds are experienced, causing heavy seas which often hold up shipping operations for days, or even weeks at a time. There is a constant risk, too, of ocean swells from south-west to north-west which cause heavy surf at the reef edge.

Rock Handling and Quarrying

After the War, Nauru came under British Mandate and the British, Australian and New Zealand Governments jointly formed the British Phosphate Commissioners, a semi-official body of three persons which purchased the assets from the original owners—the Pacific Phosphate Company, and undertook the working and exporting of the deposits on behalf of the three Governments. The Commissioners' executive control of the island is exercised from the offices in Melbourne.

The island has a small native population but the work at the phosphate quarries is mainly done by imported Chinese and Gilbertese labourers under the direction of Europeans.

As already explained, the rock is found in the form of large pockets. It is loosened from these by blasting—or in certain areas of the phosphate fields by hand picks, and is then loaded into skips. The excavations leave the coral pinnacles standing.

The phosphate weighs about 100 lb. per cubic foot when excavated, but as it must be shipped dry, it is transferred by light railway to the crushing and drying plants. Here the moisture content is reduced to about 4%, and in this state the weight is also reduced to approximately 95 lbs. per cubic foot.

The largest pieces of rock after crushing are 2-in. ring gauge, the bulk being fine gravel.

Original Handling Methods

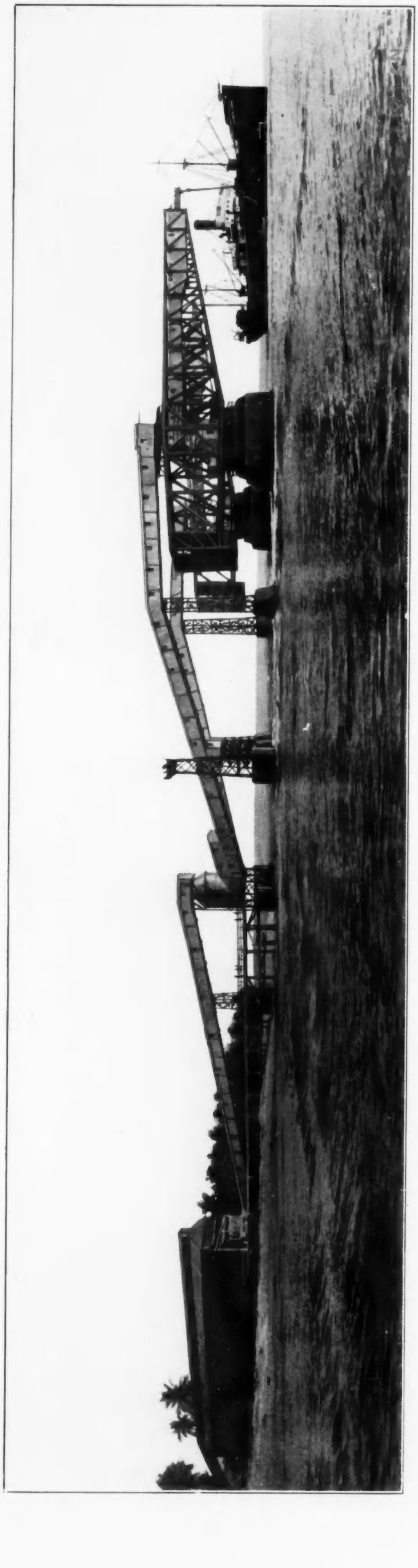
Owing to the unfavourable conditions prevailing the actual loading of ships has always presented a serious problem. Moreover, ships being loaded have to keep steam up all the time so that they can be moved quickly out to sea in the event of a sudden squall.

The original method was to load the phosphate from short timber jetties into small boats containing four baskets, and the load was then rowed out to the ship and hauled aboard.

To improve upon this, large steel cantilever jetties were built overhanging the deep water at the end of the reef. Conveyors running in galleries were installed, loading into lighters which were towed out by launches. This method, however, still involved double handling and considerable delay. The extensive mechanical loading and handling plant now installed appears to

The west end of the Shore Storage Bin and the 250-ton compensating hopper on the reef, during construction.

The Handling and Ship-loading of Phosphates in Exposed Situations—*continued*



General View of the Loadicg Plant at Naura showing the shore storage bin, compensating hopper, and cantilever loading arms.

have afforded a final solution of the problem of loading ocean-going vessels in the shortest possible time.

The New Handling and Loading Plant

The loading plant comprises bulk band conveyors to bring the phosphate from the quarries, spacious storage bunkers inter-connected by a system of conveyors and two slewing cantilever loading arms situated on the reef for delivery to ships.

In order to make possible the direct loading into ocean-going ships, special moorings had to be laid, and these are believed to be the heaviest and deepest in the world. They lie off the reef and the ship is hauled in under the loading cantilever where it is secured by an elaborate system of hawsers. All the hawsers can be cast off at almost a moment's notice—a very necessary precaution with the sudden changes of weather experienced.

Perhaps the best idea of the installation can be got by following the phosphate in its journey to the waiting vessel.

From inland storage bins it is taken by a conveyor, approximately 1,000-ft. in length at the rate of 120 tons per hour to an 80-ton compensating hopper. Here the phosphate is weighed by means of a Blake-Denison continuous automatic recording machine and then conveyed to a junction house where a further conveyor, housed in timber and steel framed gantries carries the phosphate at the rate of 180 tons per hour to the top of a 12,000-ton steel storage bin on the shore. Here a distributing conveyor in the roof discharges by a travelling tripper along the full length of the bin. The phosphate is discharged from the bin through numerous outlets along the bottom, on to a conveyor in a tunnel running the full length of the structure. Emerging from this tunnel the material is taken by a conveyor arranged in a steel gallery to a 250-ton compensating hopper situated midway between the shore storage bin and the loading arms. At this point the stream of phosphate is divided, further conveyors taking it up inclined galleries to the top of each of the cantilever loading arms. These arms reach out nearly 200-ft. over the sea and each carries a conveyor which takes the phosphate after it is received from the compensating hopper and delivers it finally through a telescopic spout to the hold of the ship.

The Shore Storage Bin

Inshore, the surface consists of sand below about 12-in. of sub-soil. Below this is a layer of soft sandstone, the total bearing value being estimated at 5 tons per square foot. The shore bin was built on this ground, and situated far enough from the edge of the reef to be above the highest water level.

The building has been designed entirely without internal bracing, to provide free discharge at every point. The walls are of mild steel plate, the loads being transferred to heavy steel columns on the outside and to mass-concrete walls in the centre. The bottom plates of the bunker slope inward at an angle of 45°, and the walls form a tunnel below the hopper.

The bin is self-discharging, twenty-four outlets being provided in one line along the bottom. Each is fitted with hand-operated gates controlled from the tunnel below.

The phosphate is discharged from the bin through travelling feed-on shoes to a conveyor with a capacity of 550 tons per hour and driven by an 80 h.p. motor. This conveyor runs level under the bin, emerging at the seaward end in an inclined steel gantry connecting with the compensating hopper on the reef.

At the west end of the bin is the main switch-house containing the master switches for the whole of the loading installation. There is also a concrete motor house accommodating the driving gear for the conveyor from the bunker to the compensating hopper.

The Compensating Hopper

This 250-ton hopper is carried on six steel uprights set in concrete piers bedded on the reef forming a protection from the sea-water and carried to a height of 9-ft. above high water level. It is circular in shape, with a conical roof, being 28-ft. in diameter and standing 56-ft. above the reef.

Access to the underside of the hopper is provided by a reinforced concrete jetty running from the retaining wall round the end of the storage bin. A 2-ft. guage railway is laid along the jetty to take trucks with a wheel base of 3-ft. 6-in., and carrying maximum loads of 5 tons.

Beneath the compensating hopper is a two-way chute with electrically-operated gates and feed control, driven by two $1\frac{1}{2}$ h.p. motors, whereby the feed can be divided for delivery to either or both loading-arms. The chutes deliver to two diverging troughed conveyors driven by 35 h.p. motors housed in the first intermediate supporting towers. These conveyors deliver to others incorporated in the structure of the cantilever arms.

All the conveyor galleries and gantries are sheeted in and fitted with windows and louvres.

Adjoining the hopper at the lower end of each of the gantries are situated Blake-Denison continuous automatic recorders for the final weighing before loading.

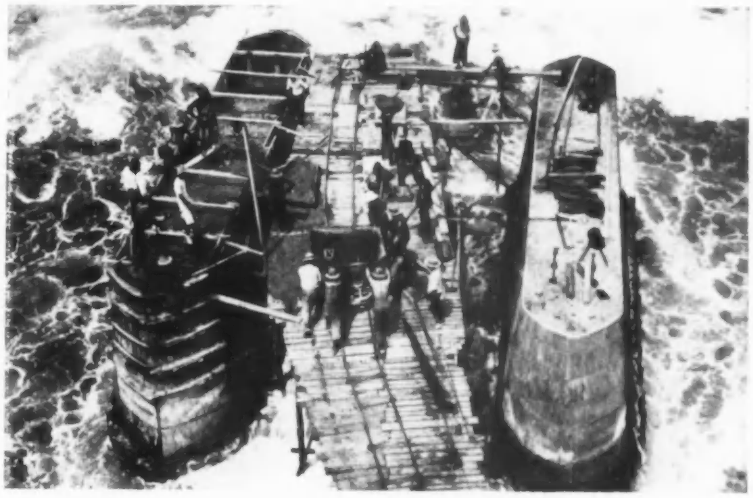
The Handling and Ship-loading of Phosphates in Exposed Situations—continued

The Cantilever Loading Arms.

The part of the reef where the cantilever arm foundations are situated is composed of dense coral rock about 5-ft. deep. Below this consists chiefly of broken coral loosely cemented by fines. The bearing capacity of the upper stratum was estimated at 6 tons per square foot, and the lower stratum at 4 tons. In preparing the foundations the coal had to be drilled and loosened with picks.

To support the structural work of the cantilever arms, large reinforced concrete piers were built of sufficient area to keep the loads on the upper crust of the reef well within the limits decided upon, due provision being made for the stresses met when loading under the worst possible conditions.

In order to provide a secure bond between the surface of the reef and the concrete base and to resist any tendency to uplift or to torsional shear due to the swinging arms being struck by ships' masts, or to other contingencies, holes were drilled in the rock, bolts and split ends were inserted, and upper and lower steel grillages were formed in the concrete. The lower grillage was anchored to the reef by the bolts.



Cantilever Piers under construction. Note heavy seas washing over the foundations.

Two piers were constructed, 28-ft. apart, for each of the cantilever arms, each pier containing 335 tons of concrete. They taper from 11-ft. wide at the base to 6-ft. at the apex, and are joined at the base by a reinforced concrete slab, a concrete apron being placed around the piers to prevent wave erosion. The load from the structure above is distributed by the two steel grillages.

Cut waters were built at the ends of the piers in order to minimise wave effect during bad weather.

The two slewing cantilever loading arms are so arranged that both can command a ship moored alongside the reef in deep water. They were designed for loading at the rate of 550 tons per hour, a figure which was soon reached. More recently the conveyors have been speeded up and the loading rate gradually increased to about 1,000 tons per hour.

As the arms have to withstand the full force of the westerly gales, they must be moored in some manner during rough weather. For this purpose a 60-ft. steel mooring mast, built on concrete, has been provided for each arm and to which it can be slewed round and anchored.

The slewing speed is one complete revolution in 12 minutes, and in addition to mooring this mobility is very useful during loading as the arms can be slewed to the various hatches, thus obviating any moving of the ship.

Each arm is a braced balanced cantilever girder with an overhang from the centre pivot of 172-ft. An extension boom giving an additional reach of 30-ft. is also fitted. The weight of each arm, which including equipment is 560 tons, is balanced by a counterweight attached to the rear end. The total weight of steelwork forming each cantilever arm, without supporting steelwork, track, and extension boom, is 260 tons, each of the two lower girders weighing 50 tons.

The depth of the main girders at the centre of the piers is 31-ft. and at the loading end 15-ft., the top of the truss at the outer end being approximately 75-ft. above low water level. Internal bracing between the vertical members of the arms is effected without any of the braces encroaching on the conveyor gantry space.

In order to keep the centre of gravity as low as possible, the counterweight boxes are carried 8-ft. below the level of the bottom girders. These boxes are 26-ft. by 31-ft. by 10-ft. overall and are ballasted with concrete, the total ballast being 160 tons.

Each cantilever arm is mounted on two circular girders 28-ft. in diameter, between which runs a ring of 18-in. cast steel live rollers. The lower circular girder is attached to four built-up plate girders of box section forming a 30-ft. square with a central cross girder carrying the 9-in. pivot pin. The upper girder, connecting flush with the bottom of the main girders, has two central cross and four diagonal girders, forming a frame to distribute the weight over the roller track.

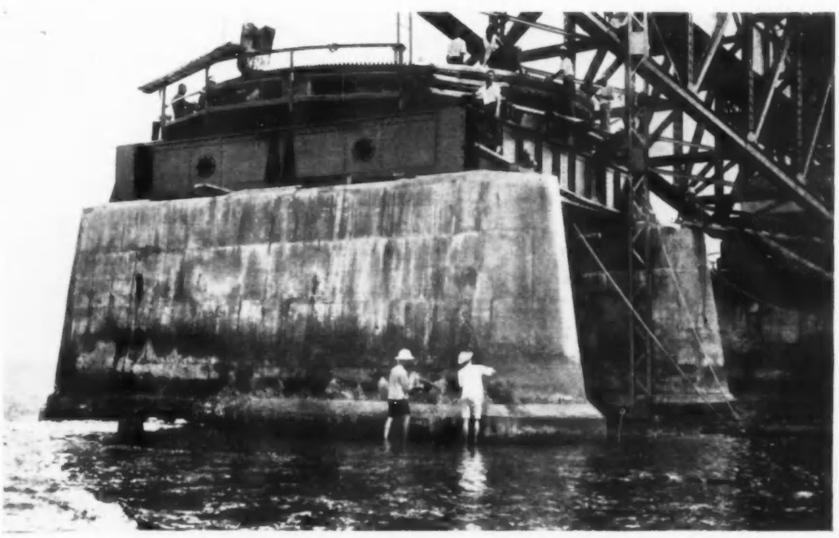
The lower circular girder also carries two toothed racks, one taking the main slewing drive and the other for a hand-operated stop. This is in the form of a double-toothed key raised and lowered by screw gear as a safety device to secure the arm when at rest.

The driving gear for slewing each cantilever is housed over the pivot and consist of a 30 h.p. motor direct coupled to a worm reduction gear. This gear drives a horizontal shaft, connected by spur gearing to two further horizontal shafts having bevel wheel drives to the two vertical shafts which are geared to the rack around the lower circular girder. A solenoid brake is fitted to the motor shaft, and there are hand-operated brakes on the countershafts. A clutch is fitted to permit the motor and worm reduction to be disconnected from the remaining section of the drive.

Each cantilever has a complete duplicate driving set as a standby. The brake gear for both sets is electrically interlocked with the clutches to prevent either motor from being started with any brake on, but if required under exceptional circumstances, both driving sets can be used.

On the top above the pivot is a roller track to support the end of the conveyor gantry from the compensating hopper.

Between the main girders of each cantilever arm, and running the full length, is a gantry which houses the conveyor taking the phosphate received from the compensating hopper. This conveyor has a telescopic extension boom 60-ft. long at its outer end, which is operated by a rope and winch geared to a 3 h.p. motor. The boom runs on a central pair of wheels, fitted with roller bearings, and rear wheels running between the flanges of the track resist the uplift. The telescopic spout at the end of each boom consists of two tubes 15-in. and 19½-in. in diameter. The upper tube is hinged and arranged to swivel, the telescoping being operated by a hand winch on the boom above.



The Reinforced Concrete Piers for one of the cantilever loading arms showing the turntable.

Electrical Equipment.

The power supply for the motors (550-volts, 50-cycles, 3-phase) is derived from the Commissioners' Diesel engine power plant on the island. Automatic control is installed for all the plant on the seaward side of the 250-ton compensating hopper, the conveyor bin valves and extension booms being operated by push buttons in control cabins at the ends of the cantilever arms. Master controllers operating contactor-type control gear for the slewing motors are installed in these cabins, and duplicate master-controllers are provided in the motor-houses at the pivots of the arms. Motors driving plant inland from the 250-ton compensating hopper are controlled by hand-operated oil-immersed starters.

The Handling and Ship-loading of Phosphates in Exposed Situations—*continued*

All control gear is fitter with no volt and overload releases, and a system of interlocking is used whereby the various sections can only be started up in the correct sequence, thus avoiding any possibility of piling up the phosphate or damaging the machinery

Push-buttons are installed at various points throughout the plant, so that machinery can be quickly stopped in an emergency.

To guard against the possibility of either cantilever fouling the other, or its own mooring mast, each of the arms is equipped with limit switches set to operate at predetermined points.

Motors are of the slip-ring type except those operating the bin valves and extension booms which are of the high torque sqirrel-cage type.

All motors seaward of the compensating hopper are of totally enclosed weather-proof construction; those on the inland side are pipe ventilated.

The rating of the motors is such that a low temperature rise is obtained, special insulating being used to withstand severe tropical conditions.

Inter-communication between all control points is by telephones of the mining type, fitted with loud ringing bells.

The electric lighting installation is totally enclosed and weather-proof, and in addition to the general lighting of gantries, etc., flood lighting is installed to permit efficient working by night. Powerful flood lamps are installed at various points, two being fitted at the end of each cantilever arm to illuminate the ships.

View showing the two Cantilever Loading Arms swung inshore and made fast to the mooring masts.

Additional Plant

Since the completion of the handling installation and loading cantilevers described above, considerable extensions have been made to the storage accommodation and the handling equipment. The first extensions took the form of additional storage facilities for dried phosphate which accumulates in bad weather when shipping is delayed.

This new plant, known as Unit No. 2 ,comprises a storage bin of 16,000 tons capacity, conveyors from the existing drying plant to the new store, and from the bin to the loading plant.

The bin is 184-ft. long, 118-ft. wide and 30-ft. high to the gallery floor. The floor is level, with reinforced concrete retaining walls on all four sides, and a steel framed covering built to the angle of repose of the material. The covering is supported by the walls, and by two lines of steel stanchions.

A gallery in the roof houses the conveyor feeding the bin, while below the floor are eight tunnels accommodating the discharging conveyors.

The distributing conveyor is 20-in. wide and 230-ft. long. It is driven by a 10 h.p. motor through worm reduction gear at a speed of 200-ft. per minute. A Blake-Denison automatic continuous recorder is arranged at the tail end. A travelling tripper carrying a cross conveyor is also provided for distributing the material to any point of the bin.

There are 130 bin outlets, having steel liners fitted with rack and pinion valves operated from the tunnels. The outlets deliver to eight 18-in. conveyors, each driven by an 8 h.p. motor and provided with a travelling feed-on carriage, which in turn deliver to the existing loading equipment already described.

70,000 Ton Storage Bin.

The next addition was the provision of a dry phosphate storage bin of 70,000 tons capacity, complete with all necessary conveyors, this being part of Unit No. 3.

This latest bin is 300-ft. long, 197-ft. wide, and 50-ft. high. It is of similar construction to the 16,000-ton bin with reinforced concrete walls carrying a steel roof inclined to the angle of repose of the material and with two galleries in the roof for the conveyors feeding the bin.

The floor is level with six reinforced concrete tunnels below for the discharging conveyors.

The two feed conveyors in the roof receive the phosphate from a 24-in. conveyor running at right angles to them. This conveyor, which is 230-ft. long and driven by a 20 h.p. motor is carried in an inclined steel gantry, and brings the phosphate from the drying plant.

There are 250 outlets under the bin fitted with double rack and pinion valves and operated from the tunnels.

The six discharging conveyors are each 24-in. wide, 290-ft. long and driven by 10 h.p. motors. They deliver the phosphate to a 30-in. wide conveyor at right angles which, in turn, discharges to the loading plant.

Phosphate Drying Plant

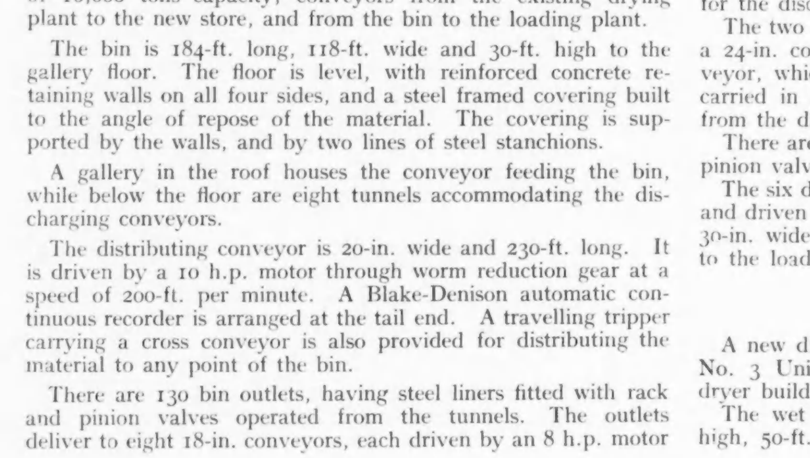
A new dryer plant has also been installed in connection with No. 3 Unit. It comprises a wet phosphate storage bin and dryer building, linked by conveyors.

The wet phosphate bin is built of steel plates and is 50-ft. high, 50-ft. wide and 50-ft. deep. The bottom is in the form of four hoppers, which are controlled by double rack and pinion valve slides. The wet phosphate is fed from ground level by a 36-in. conveyor from the crushers to the top of the bin where two short conveyors, running at right angles, feed direct to the bin. The main conveyor is driven by a 20 h.p. motor at a speed of 300-ft. per minute.

Below the hoppers and fed by travelling feed-on carriages, are two 18-in. conveyors which carry the material direct to the rotary dryers.

The dryer building is a steel-framed structure covered with asbestos cement sheeting. It is 110-ft. long, 60-ft. wide and 26-ft. high, with a series of ventilators along the roof. Housed in it are the rotary dryers, fans and furnaces, etc.

When dry the phosphate is taken on to a conveyor to a further similar conveyor where it is weighed on a Blake-Denison continuous weigher and recorder. It then goes to the 70,000-ton storage bin to await shipment.



The Two Cantilever Loading Arms with a vessel moored ready for loading.

Notes of the Month

New Port at Fredericia

The opening some time ago of the Lillebelt Bridge, Denmark, meant that the Port of Fredericia lost its formerly extensive ferry traffic. It is interesting to observe, therefore, that the port has decided to spend approximately five million kroner on the construction of a new traffic harbour with a water area of 50,000 sq. metres, 35,000 sq. metres of land space, about 1,000 metres of quayage, and water depths of from 7 to 9 metres.

Reconstruction of Wharf at Tokomaru Bay

The Tokomaru Bay Harbour Board, N.Z., has passed plans for the reconstruction of the wharf at Tokomaru Bay and the erection of a retaining wall behind which reclamation is to be carried out. The berthage portion of the new wharf will be of timber, and will be connected with the shore by a reinforced concrete viaduct 950-ft. in length The scheme will cost over £25,000.

Clyde Navigation Improvements

The Clyde Navigation Trust has under consideration a scheme for the deepening and widening of the Clyde and the removal of the dangerous bends at Dalmuir and Erskine. The Commissioner for Special Areas has granted the sum of £70,000 towards the cost, and should the present plans mature, it is hoped that the work will be completed before the launching of the White Star Liner " No. 552," now in course of construction at Clydebank.

Dock Labour: Housing Experiment at Hamburg

An experiment in the decasualising of dock labour is in progress at the Port of Hamburg, where on an estate specially allocated for the purpose, each labourer occupies a small-holding of about half-an-acre. The men are summoned to dock work in definite rotation, and the intervals of unemployment are devoted to tillage of their plots of ground, so that they do not have to waste time in hanging about the streets pending the next call, as is the case with casual labour. It is stated that the labourers derive considerable pecuniary benefit from the produce of the plots.

Antwerp Shipping Congress

At a recent conference (Congrès de la Mer) held at Antwerp, representations were made to the Government in connection with works to be executed at the Port of Zeebrugge, particularly as regards the extent of dredging operations in order to ensure accessibility at all tides and under all weather conditions. The question of developing the Port of Zeebrugge in competition with the more important ports of Antwerp and Ghent is one which has given rise to some difference of opinion in Government circles. It is felt that any expenditure in this direction would be more than the Belgian Treasury can afford to undertake at the present time, although, on the other hand, the utility of the port during a war period would be very great.

Additional Dredger for the Mersey

The second of two twin-screw 1,100-ton hopper dredgers recently ordered for the Mersey Docks and Harbour Board, was launched towards the end of September.

The vessel is fitted with three Priestman Grab Cranes for dredging to a depth of 60-ft. below water level, and is propelled by two sets of triple expansion direct-acting surface-condensing engines, and has a speed of 10½ knots per hour in loaded condition. Independent steam mooring winches are fitted at bow and stern, and the hopper doors are controlled by steam-driven hopper winches for raising and lowering.

The dredger with its machinery has been constructed by Messrs. Wm. Simons and Co., Ltd., under the direction of Mr. T. L. Norfolk, Engineer-in-Chief to the Mersey Docks and Harbour Board.

Developments at the Millwall Docks

It is announced that the Port of London Authority intend to put in hand forthwith the part of their development programme of twelve millions sterling, which relates to the improvement of the Millwall Docks. The entire length of the East Quay of the Inner Dock (1,310-ft.) is to be widened and the dock itself will be dredged to give a uniform depth of 29-ft. of water. A new two-storey shed, 312-ft. long by 100-ft. wide, is to be erected on the widened quay.

For the purpose of effecting these changes, No. 4 Dolphin, hitherto used for the discharge of vessels from West African ports, will be removed.

A contract for the work has been placed. The estimated cost is about £110,000 and the time for completion, about eighteen months.

Pillau Harbour Development

Work on the development of the inner harbour at Pillau has been commenced, and dredgers are working in the fairway by day and night. Through traffic to Konigsberg and Elbing is not affected.

Coal Bunkering Plant at Fleetwood

Six large electric coaling plants, each capable of bunkering two trawlers with 160 tons of coal in each in less than 2½ hours, have been installed by the London, Midland and Scottish Railway Company. The installation is part of a modernisation scheme at the Company's docks at Fleetwood, the cost of which will total £85,000. Hitherto the coaling of trawlers at Fleetwood has been performed by crane and bucket, 4 hours being taken to bunker a trawler with 80 tons of coal. The same operation with the new plant takes only one hour and ten minutes. Three of the new coaling plants serve the Wyre Dock and the other three the Fish Dock, and the new facilities will reduce the time that trawlers have to stand over between trips.

Impending Harbour Improvements

The following impending works are announced:—

Bangor, County Down.—The Town Council has approved a scheme for the construction of a permanent viaduct at an estimated cost of £25,000. The structure will be of concrete and will replace the timber work of the North Pier.

Belfast.—The Town Council are considering promoting a Bill in Parliament to obtain powers to carry out reclamation works on the foreshore of the Belfast Lough.

Keadby.—The Trent Navigation Company are contemplating developing Keadby as an inland port.

Lymington. An amended scheme for extending the landing stage has been passed by the local council.

Dredging Salina Cruz

The work of dredging the outer harbour at Salina Cruz, Oaxaca, Mexico, undertaken by the Mexican Government ten months ago, is now nearing completion. Owing to the silting up of 60% of the outer harbour, the port has been practically abandoned for about nine years, but it is expected that it will be open for shipping in the near future The work has so far been carried out by the American dredger " Minnesota," but the Mexican Government have now taken over the " Coatzacoalcos," the third of a series of four suction dredgers built by Lobnitz and Co., Ltd., Renfrew, and the rest of the work, with which the " Minnesota " cannot cope, will be carried out by this vessel. Once the port has been opened, it will be kept from silting up again by the construction of a jetty, and it is expected that the facilities offered by the port will make it a popular one.

Extension Scheme at Avonmouth

The Port of Bristol Authority have decided, subject to the approval of the City Council, to proceed with a scheme of extension at Avonmouth Docks, which it is estimated will cost approximately £800,000. The proposal is to increase the Eastern Arm of the Royal Edward Dock beyond the area reserved for development when the dock was originally planned. The first extension of the Eastern Arm was opened in 1928, but the whole of the extension for which powers were obtained from Parliament was not completed. Increasing trade has necessitated additional berthing accommodation by a further extension of the Eastern Arm. This will afford four more berths and give an additional 10 acres of waterway. The large expenditure involved will necessitate an application to Parliament for new powers, and should the scheme mature, considerable alteration in the docks railway system will have to be made.

Port of Beira Development

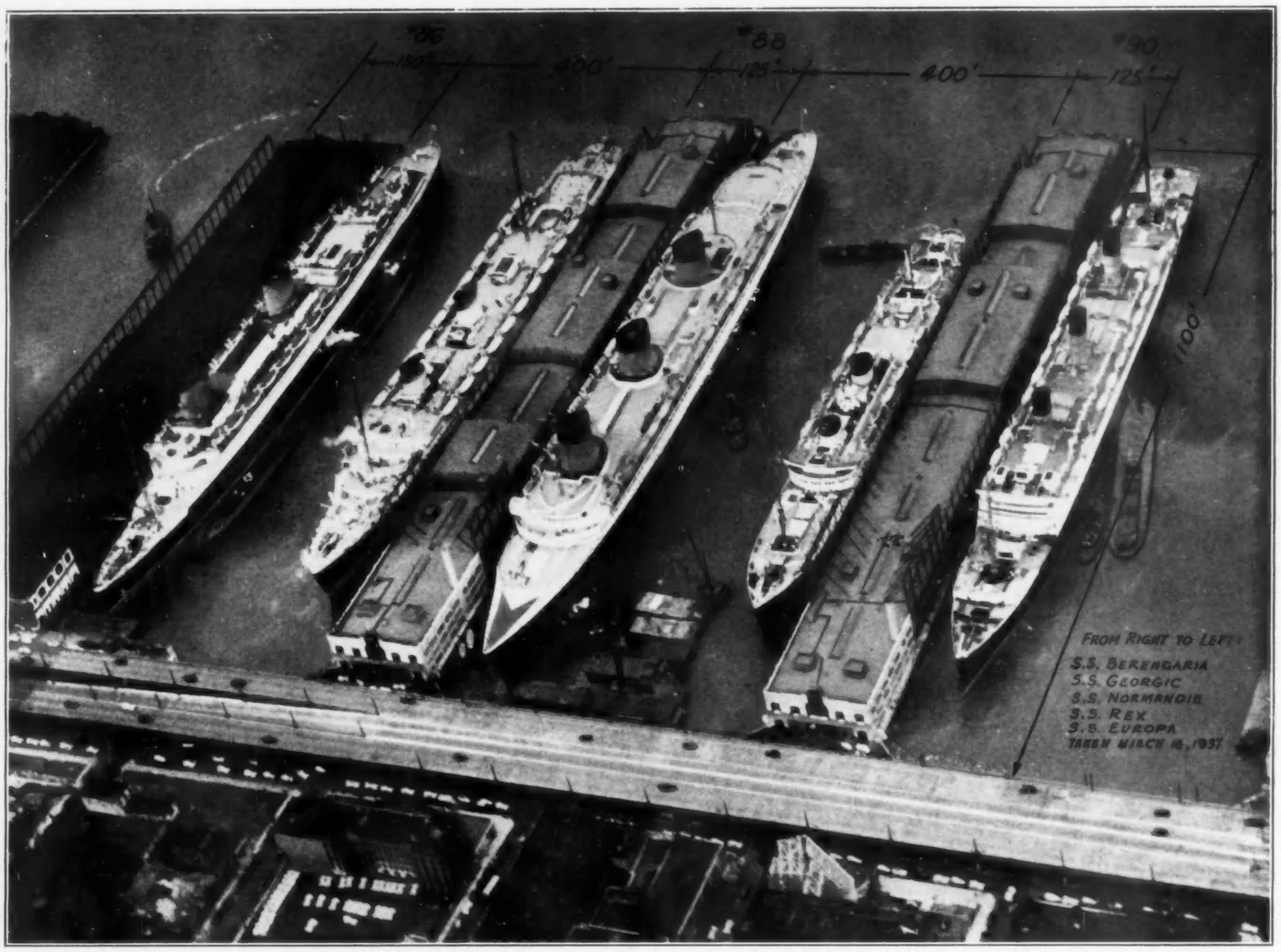
At the annual meeting of the Port of Beira Development, Ltd. held in London recently, it was announced that arrangements had been made for the following improvements at the port to be commenced forthwith:—

(1) The construction of one additional deep-water berth 600-ft. in length, equipped with two 6-ton and three 3-ton power travelling cranes.
(2) The construction of two large transit sheds immediately behind the existing wharves.
(3) An extension of the electric power station.
(4) Reclamation of areas behind the existing wharves.

Beira has now become a port of call for the seaplanes of Imperial Airways carrying the air mail to and from the United Kingdom, and the revised service was inaugurated by the arrival of the seaplane " Cambria " at Beira on the 26th of May.

Passenger Accommodation at the New Superliner Terminals (Piers) at the Port of New York

By R. S. MACELWEE, B.S., M.A., Ph.D.



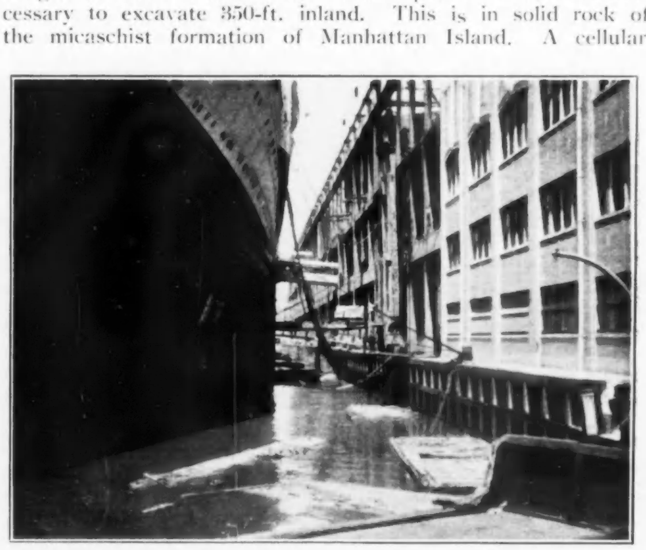
Photo] *View of Piers Nos. 86, 88 and 90. Manhattan* [Rudy Arnold

THE new tendency of various world ports to afford passengers adequate, attractive and comfortable accommodation is characteristic of the new Port of New York super-liner terminals (piers) Nos. 88, 90, 92, made available 1935-36-37. The three new terminals with the two adjacent piers 84 and 86, which are occupied by the German Lines, constructed several years ago, form the largest and finest array of passenger terminals in the world. The above photograph shows an air view of these piers taken March 18th, 1937, with an unusual assembly of great trans-atlantic liners at their berths. These are the ss. "Berengaria," (ex "Imperator"), Cunard White Star Line; ss. "Georgic," Cunard White Star Line; ss. "Normandie," Compagnie Génerale Transatlantique; ss. "Rex," Italian Line; ss. "Europa," H. A. P. A. G. Lloyd Lines.

The 3-storey sections of piers 88 and 90, 55-ft. above water, are visible. These are to enable horizontal gangways to be run to the upper decks of very large ships. Fuel oil barges are seen in the slips.*

The piers are 1,100-ft. long and 125-ft. wide. The slips are 400-ft. wide. The inshore ends are on solid fill, the outer portions on timber pile clusters, with concrete caps, concrete floor beams and concrete floors, the superstructure is of steel frame, with steel doors, heat resistent glass and asbestos wall panels finished to resemble wood. There is an elaborate sprinkler system for fire protection.

The constructional details of these news piers are very interesting. There are two innovations of importance made to oversome restrictions to pier dimensions at the Port of New York. For generations the riparian rights of the City were limited in the width of the land at the end of cross town streets. This prescribed narrow piers and narrow slips between. The United States Government, through the Corps of Engineers of the United States Army under the Secretary of War, has jurisdiction over all navigable waterways in the United States of America. They fix bulkhead and pierhead lines in all navigable waters, in the interest of navigation. To build 1,100-ft. long piers with 400-ft. wide slips for half-a-mile frontage necessitated the purchase of the entire water-front behind piers 86 to 92. The War Department permitted an extension of the pierhead line 75-ft. The City of New York bought the water-front. The Dock Department found it necessary to excavate 350-ft. inland. This is in solid rock of the micaschist formation of Manhattan Island. A cellular



Photo] *S.S. "Normandie" alongside Pier No. 88* [R. S. MacElwee

Note the Cantilever Telescoping Retractable Bridge to Side Port for Trucks and Automobiles—Passenger Gangway to Upper (2nd) Deck

*"Slip" is an American term for the water space between projecting jetties or piers, which in the United States are termed "docks."—Ed.

Port of New York—continued

Photo] *Customs Inspection, Pier No. 90* [R. S. MacElwee

Photo] *Luggage Conveyor* [R. S. MacElwee

cofferdam, half-a-mile long, was built around the area to permit rock excavation in the dry to a depth of 46-ft. This is the largest cofferdam in civil engineering history. The Army Engineers expect an appropriation of $4,000,000 from Congress to widen and deepen channels to 46-ft. and widen to 2,000-ft. from Ambrose Lightship at the entrance to Ambrose Channel through Hudson River to Fifty-ninth Street.

Quarantine practique has been simplified by the report of ship's medical officer by radio, 12 miles out. This obviates delay for practique at Quarantine.

The total cost of the super-liner piers is $20,000,000, about £5,000,000. The work was done under the administration of Mr. John McKenzie, Dock Commissioner, Major F. T. O'Keefe, Chief Engineer, and Mr. Joseph Halpern, Chief of Engineering Design.

The Port of New York handles about 90 per cent. of the foreign passenger travel of the United States of America.

In the foreground of the 1st photograph is seen West Side Elevated Highway. To the left, in this picture, is a ramp to West Street level at the new piers. This elevated highway has three traffic lanes in each direction. There are no traffic lights and travel at 40 miles an hour is continuous. To the north the elevated highway leads to Riverside Drive and across the Harlem at Spuyten Duyvil to all points north and north-east. At 180th Street connection is made to the George Washington Bridge across the Hudson River. Southbound this elevated highway leads to the Battery, south tip of Manhattan Island. There is a ramp to the entrance of the Holland Vehicular Tunnel. The Newark Air Port is half-an-hour from the piers. Here modern fast commercial air-and Canada. Chicago is 4½ hours distant. Los Anieles or planes fly on schedule to all parts of the United States San Francisco are 16½ hours eastbound and 17½ hours west-bound.

The Passenger Accommodation

The inshore 200-ft. of each pier is alloted to the reception of passengers. On the West Street is a large entrance for motor lorries to the main-cargo-deck of the pier. On each side is a passenger entrance with two elevators, a stairway and a luggage conveyor, to the second deck for passengers. Piers 88 and 90, French and Cunard Lines have passenger escalators.

On the main deck at the back of the passenger entrance and enclosed by fire walls are the heating plant, oil, fuel and the incinerator for refuse disposal. The heating plant maintains a temperature of 70 degrees fahr. in cold weather. There are 75 rooms in this building. The mezzanine has offices, gear storage rooms and toilet rooms.

The second deck, as also the third deck, of each pier is entirely for the use of passengers. The street end has a lobby, Pier 88 and a large waiting room, Pier 90. Pier 88, French Line, has a lobby a lounge with adjoining lavatory accommodation for gentlemen on one side and for ladies on the other side. At Pier 90—Cunard White Star Line—the lounge has similar accommodation at each side for gentlemen and for ladies respectively. Cold water drinking fountains, of the bubbler type, are placed at convenient intervals.

Much care has been taken in artistic and practical interior decoration and furniture. Wall coverings are of enamelled steel or marble or wood panelling on fireproof walls. Floors are of coloured terrazzo, tile and marble inlaid linoleum. Stair railings are of aluminium. Lighting fixtures of cut glass and chromium.

Out from the passenger lounges is a series of offices for cable, telegraph, telephone, luggage transfer, Customs and ticket offices.

Pier 88 is leased by the Dock Department to the French Line—Campagnie Générale Transatlantique. The Dock Department architects had assigned to them, by the French Line for interior decorations, M. Greber of Paris, in charge of the 1937 Paris International Exposition. All interior decorations and furniture were designed for this maritime passenger terminal.

The main lobby of the passenger station on the second deck is shown in the photograph. The pleasing colours are lost in the photograph. The floor is a light tan mosaic with a map of Paris in mosaic. The walls are panelled in marble with bas relief pictures and the coats of arms, in colours, of the chief cities of France.

A corner of the lounge for ladies is shown in a photograph. This and the lounge for gentlemen are panelled in hardwood,

Photo] *Shore End of Pier No. 90* [R. S. MacElwee
Note the Line of Taxi-cabs moving to pick up Passengers

Photo] *Passengers' Waiting Room, Pier No. 90* [R. S. MacElwee

Port of New York—continued

Photo] *Passengers awaiting Customs Officer, Pier No. 90* [R. S. MacElwee

composite floor tiles, cut glass and chromium light fixtures. The furniture is chromium plated with tan velvet or leather upholstering. Each lounge has a wash room and toilet facilities.

Outside the passenger rooms are the offices for telegraph, cable and telephone service. Also, there is an office for trunk and heavy baggage transfer to railroad stations, other ship piers or hotels. Two passenger elevators are available near by.

Pier No. 90, at the foot of West Fiftieth Street is leased to the Cunard-White Star Lines. Structurally it is identical with Pier 88. The two entrances for passengers on each side are the same, with two passenger lifts and a luggage conveyor.

The passenger accommodation on the second deck is also different, although comfortable and attractive. The waiting room is much larger and serves both ladies and gentlemen. Wash rooms are at each end toward the side of the pier. Flooring, panelling and furniture are in excellent taste. A large reading and rack for periodicals is located in the centre. At one corner is the Western Union Telegraph and Cable desk and in another corner the baggage transfer desk. The windows are provided with venetian blinds. The atmosphere of cool, quiet comfort is pleasing. Furniture is of chromium plated frames with brown leather coverings.

The Cunard-White Star Line offices are on this deck, on each side of the pier, leaving ample space in the middle of the pier. These offices are for the marine superintendent, baggage and ticket agents, physician and nurse, Customs officials' office and several other offices of the steamship company directly connected with the bunkering, victualling and turning around of the many large ships of this line from the "Queen Mary" down the list.

The passenger decks, Customs, baggage conveyors, lighting, painting and many other details are similar to Pier 88. No freight is handled on the passenger decks, other than passengers' personal property. All of the 75 rooms have forced ventilation and are heated to a temperature of 70 degrees in cold weather.

The remainder of the second deck and the intermittent third decks are used exclusively for passengers. Letters of the alphabet hang from beam girders, at intervals, to indicate the location of passengers' luggage for Customs inspection. The classes First-Cabin-Tourist are divided by low wooden picket fences on feet, moveable in sections as required. There are several tables for Customs inspectors in each class section. A similar barrier extends across the pier, near the passenger rooms, with gates where Customs inspectors pass the passengers with their luggage.

Photo] *Passenger Deck. Pier No. 90* [R. S. MacElwee

The porters carry luggage and trunks on 2-wheeled hand trucks. There is a wide clear storey with side windows that give good lighting in the day time. Many electric lights supply illumination after dark. The steel doors, and steel frame and columns of the pier are painted with aluminium paint for the maximum of light and cheerfulness. The concrete floors are washed and swept frequently.

Luggage and trunks are moved between the pier and the ship by continuous electric-driven conveyors.

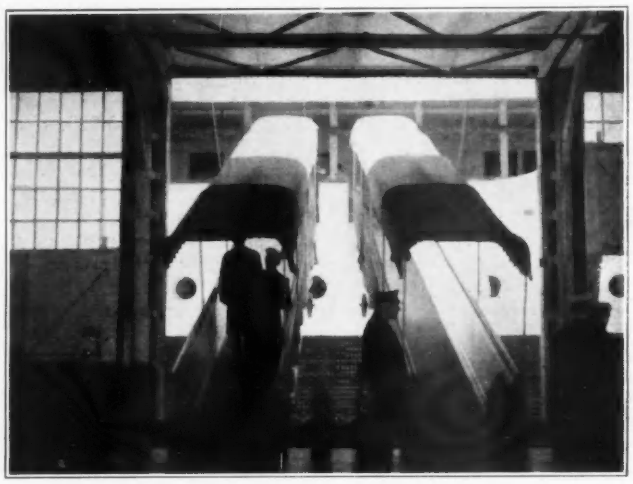
The outer end of the second pier deck is a large clear place for friends and sightseers.

Passenger and Baggage Handling

For the movement of passengers and luggage, there are nine lifts, five for passengers and four for luggage. The passenger lifts have a capacity of 4,500 to 6,000 lbs. and a speed of 150-ft. a minute. Passenger lifts also serve the third deck. The four luggage lifts have a capacity 12,000 lbs. and a speed of 60-ft. a minute. All lifts are of the micro-levelling type giving floor level adjustment. Each lift is enclosed in a fire-proof shaft.

On pier 88, French Line, are two electric escalators. Each has a capacity of 8,000 passengers an hour. The escalator is gaining in use in railway stations, department stores, subways and other buildings in the United States. They are provided with visible and audible alarms and safety devices to protect the passengers from any accidents.

The baggage handling is expedited by electric baggage conveyors, one for each entrance. These are wide belts of slats with cleats and can run in either direction.



Photo] *Pier End of Gangways* [R. S. MacElwee

At pier 88 a new type of cantilever telescoping bridge is provided to reach the side ports from the cargo deck. When not in use this bridge is telescoped and raised against the side of the pier. The forward side of "The Normandie" is far from the side of the pier due to the flare of the hull. The bridge is used to form a connection with the forward 'tween deck space of the ship. The bridge is used primarily for shipping and landing passengers' automobiles. There has been a great increase, in recent years, in the number of people who take their automobiles to Europe to tour in leisure. The various transatlantic steamship companies have established departments to encourage and assist passengers in foreign automobile touring. Tours are planned and road maps are provided and customs simplified by a *triptique*.

Private automobiles and taxis serve the pier entrances in long lines, delivering or picking up passengers with great dispatch. The marginal West Street is very wide.

The Institute of Transport.

The Council of the Institute of Transport has made the following among other premium awards in respect of the session 1936-37:—

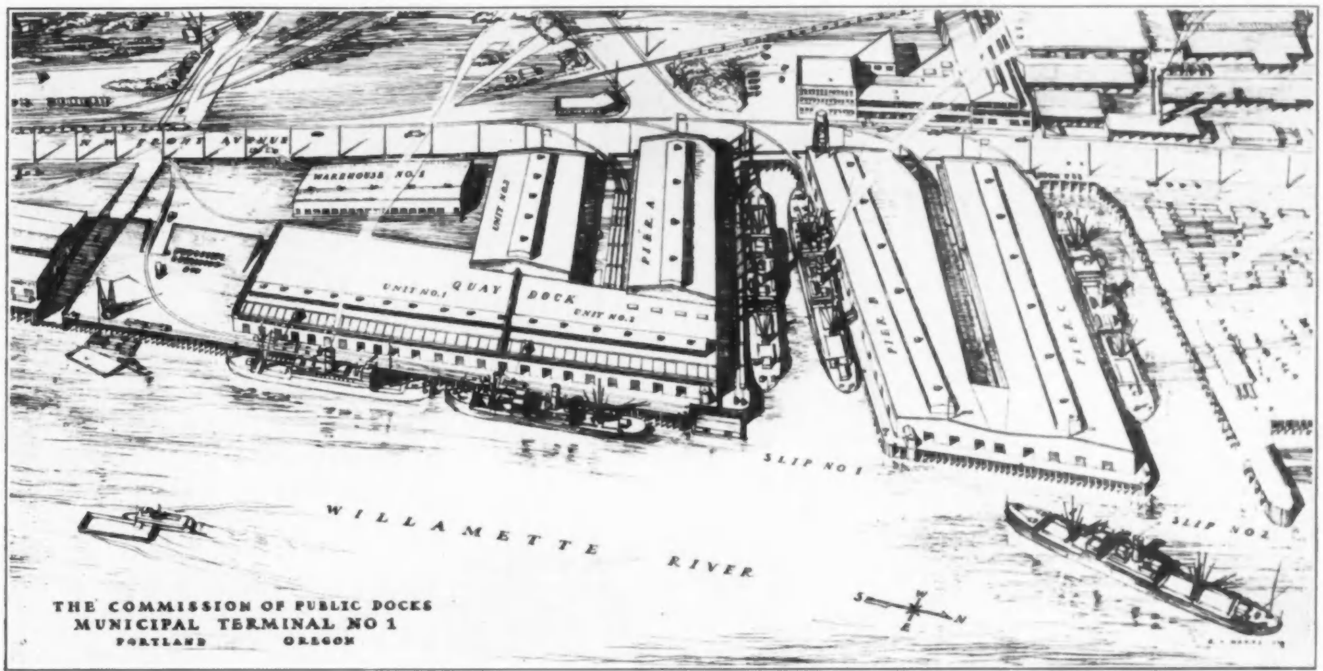
Dock and Harbour Gold Medal. (Donor: The Dock and Harbour Authorities' Association). To Sir Lionel A. P. Warner, C.B.E. (Member), General Manager and Secretary, Mersey Docks and Harbour Board, for his paper on "Some Considerations of problems affecting port management."

Coastwise Shipping Medal. (Donor: Sir Alfred Read). To M. A. Robinson (Member), Joint Manager, Coast Lines, Ltd., Liverpool, for his paper on "The Coasting Trade—modern development and trend."

Sir Alexander Gibb, G.B.E., C.B., F.R.S., will be inducted as President at the first ordinary meeting of the Institute for the session 1937-38, which will take place at the Institution of Electrical Engineers on Monday, October 11th, 1937, commencing at 5.30 p.m., when he will deliver his Presidential address.

The Port of Portland, Oregon, U.S.A.

By *PHILIP H. CARROLL, Executive Secretary.*



Port Trade

IN the autumn of 1932, the writer prepared an article for the "Dock and Harbour Authority," covering the facilities of the Port of Portland, Oregon, U.S.A. In looking back over the five years since the last article was prepared and in spite of the many vicissitudes to which shipping on the Pacific Coast of the United States has been subjected in the interim, it is nevertheless encouraging to note that the Port's tonnage has constantly shown an increasing volume each year since 1932, as shown by the following table:

DEEP SEA TONNAGE

1931	1932	1933	1934	1935	1936
4,843,300	3,984,042	4,017,503	4,099,899	4,395,880	4,681,362

From the above, it will be seen that 1932 was the low year in point of cargo tonnage passing through the Port during the recent depression which has effected every business and industry in the United States. The continued upward trend of shipping at Portland since 1932 is all the more encouraging when it is recalled that during 1934 an 85-day maritime strike practically paralyzed shipping along the entire Pacific Coast of the United States, with the attendant loss in tonnage movement during the period of the strike. Following the settlement of the 1934 strike in July of that year, minor disputes and stoppages of work occurred almost daily until September 30, 1936, when the agreements between the employers and employees officially terminated. From then on, the shipping public, because of the possibility of another strike became alarmed, and wherever possible, resorted to other means of transportation for the movement of their shipments. The fears of the shippers, unfortunately, were all too well founded, and during October of last year, efforts of employer and employee to reach some satisfactory understanding were without success and the workers' representatives called a strike at midnight October 29, 1936. This strike continued throughout the balance of the year and into the early part of the present year. The steamship owners during the strike made no attempt to operate their vessels, and at one time some 225 American flag vessels were tied up at the ports of the Pacific Coast. This complete paralysis of shipping on the Pacific Coast has, naturally, resulted in heavy losses to the steamship operators as well

Piers and Tank Farms of three Petroleum Companies, Portland

Port of Portland, Oregon, U.S.A.—continued

as those who have investments in terminal facilities, to say nothing of the many industries which have either had to curtail or shut down entirely because of their inability to secure water transportation for their products.

Port Improvements

With the improvement in ocean trade during recent years, some important improvements to Portland's shipping facilities have been constructed. The General Grocery Co. Inc. has constructed a combination pier and warehouse, giving them a berthing space of 300-ft., and a total covered floor space of 135,000 sq. ft. Recently, the Santa Cruz Cement Co. constructed a new plant, having a 400-ft. wharf, and equipped with pipe lines for discharging bulk cement from their bulk carrier to storage silos. These silos have a combined capacity of 82,500 bbls. The McCormick Steamship Co. in recent months completed the reconstruction of Unit No. 2 of the McCormick Terminal, giving them 350 additional feet, and making a combined berthing space of 1,650-ft. along the River.

Bonneville Project

By far the most important piece of construction to Portland from an industrial standpoint is the Bonneville Dam project, located on the Columbia River some 42 miles east of Portland. When completed, this gigantic project will undoubtedly have a powerful influence on deep sea commerce as well as on the industries which will spring up following the completion of the dam. The Bonneville Dam is being built by the Corps of Engineers U.S. Army, and the Federal Government has already allocated $40,000,000 for this work and some additional millions will undoubtedly be appropriated to complete the task. The dam consists of three major features, namely, a spillway dam on the north side of the Columbia River, a navigation lock, and a power house on the south side of the Columbia. When this work is completed, deep sea navigation will be able to steam up the Columbia River to The Dalles, approximately 95 miles east of Portland, and about 187 miles from the mouth of the Columbia River. The following data relating to the navigation lock, furnished by the Corps of Engineers U.S. Army on the Bonneville projcet is of interest:

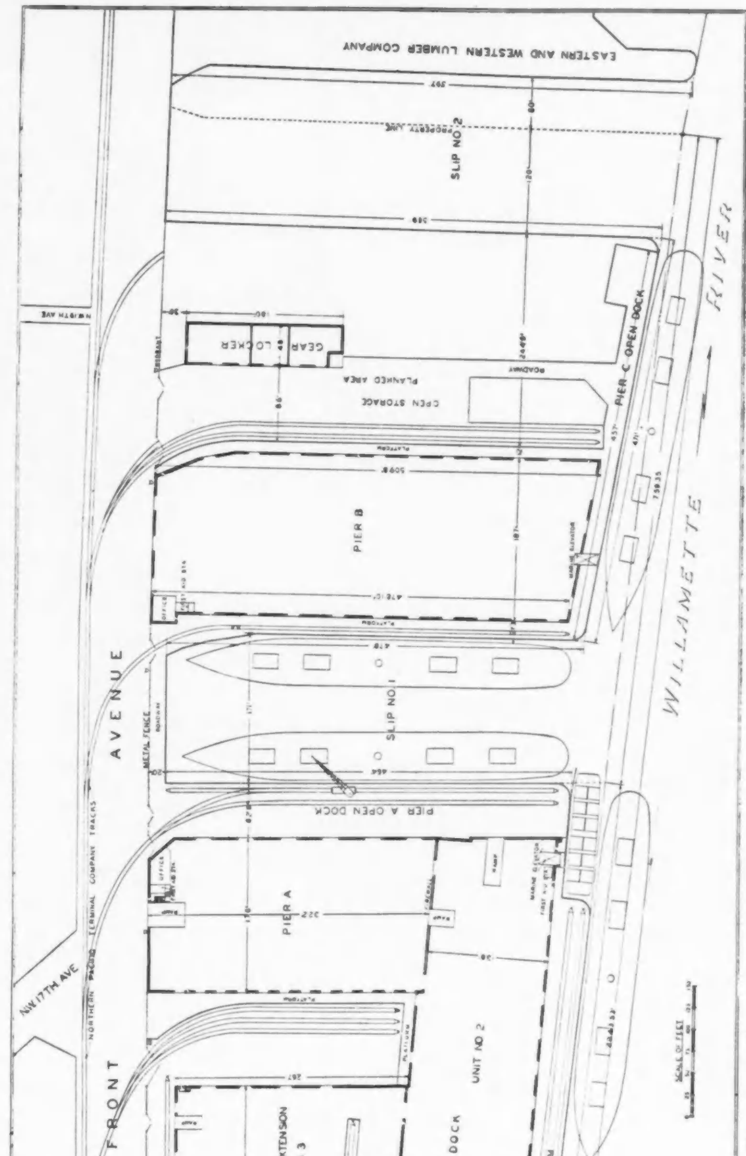
NAVIGATION LOCK

Lift at low water (highest ever built) ...	66-ft.
Lift at normal flow	59-ft.
Lift at extreme high water, or 1894 flood	30-ft.
Width in clear dimension	76-ft.
Length in clear dimension	500-ft.
Height of upper mitre gates	45-ft.
Height of lower mitre gates	102-ft.
Depth over lower mitre sills 98% of the time	26-ft. or more
Depth over upper sills	30-ft. or more

Municipal Terminal No. 1

Terminal No. 1 lies at the foot of North West Seventeenth Avenue on its Western side. Hitherto it has provided berthage for five vessels serving European, Coast-wise, Inter-coastal and Trans-Pacific traffic. The covered shed area has been 349,600 sq. ft. with 78,500 sq. ft. of open storage. In the latter part of 1936, the Public Works Administration in Washington, D.C., approved the application of the Commission of Public Docks of the City of Portland to reconstruct the Terminal and the work is being carried out under a grant by the Federal Government through the Federal Emergency Administration of Public Works. The total cost of the project is approximately $729,000, of which the Government will contribute 45 per cent. and the Commission of Public Docks the remainder. The work, which is now in hand, is expected to be completed during the current year.

Under the reconstruction scheme, an additional 327-ft. of berthing space to the South of the Quay Dock will be available, and along the 957-ft. of river frontage of the Quay Dock, rail tracks will be provided for direct transfer to vessels. Unit No. 3 of the Quay Dock, providing 51,800 sq. ft. of shed area, together with the 12,566 sq. ft. of additional shed space, created by widening Units Nos. 1 and 2 of the Quay Dock, will increase the upper level covered area by nearly 60,000 sq. ft. The open ground to the South of the Quay Dock, when surfaced, will provide ample storage for timber and other commodities not requiring protection.



Municipal Terminal No. 1, as reconstructed

Terminal No. 1, on completion of its reconstruction, will afford berthage for six vessels.

Port of Portland, Oregon, U.S.A.—continued

Aerial View of Upper Harbour. Retail Business Section in foreground.

Historical and Geographical

Portland, Oregon, is one of the oldest cities in the Pacific Northwest, and was incorporated in 1851. It now has a population in excess of 300,000, and is located on the Willamette River, approximately 96 miles from the mouth of the Columbia, and 10 miles from the confluence of the Willamette and the Columbia Rivers. The tributary area to Portland consists of the Inland Empire, of some 200,000 sq. miles reached by water grade through the Columbia Gorge, and likewise to the south the Willamette Valley with an area of some 11,000 sq. miles is part of Portland's hinterland. Portland is served by four trans-continental railroads, and numerous auto truck lines extend to all points in the West and even as far east as Chicago and Minneapolis, and together with the railroads and river steamers serve the vast areas tributary to Portland. The deep sea channel from Portland's harbour to the Pacific Ocean has a minimum width of 500-ft. and a depth of 35-ft. The harbour proper, with some 27 miles of deep water frontage, varies in width from 900 to 1,600-ft. Besides the modern Municipal Terminals operated by The Commission of Public Docks, Portland is well equipped with privately owned and operated terminal facilities sufficient to take care of all the needs of the port's maritime commerce.

Port Administration

Besides The Commission of Public Docks, a department of the City of Portland, which has control over the entire waterfront and operates the Municipal Terminals, there is also the Commission of the Port of Portland, whose functions are: channel maintenance, towage, drydock and airport operations. River steamers connect Portland with various point on the Columbia and Willamette Rivers and the Port is served by some 50 odd steamship lines which open the markets of the world to the shippers of the Portland territory. Since 1868, when the Barque, "Helen Angier" took the first direct shipment of grain from the Columbia River to Liverpool, wheat has been an important factor in the up-building of this Port. Besides wheat, other important commodities moving in and out of Portland are:

Apples and Pears (fresh)	Lumber and Logs
Canned Goods	Pulp, Paper and Paper Products
Cement	Petroleum Products
Copra	Salt
Corn	Scrap Metal
Flour	Sugar
Fruits	Sulphur
Grain Bags and Burlap	Wool

Excerpts from Annual Report of the Chairman of the Commission of Public Docks, Portland, Oregon

In connection with the article on the Port of Portland, Oregon, the following extracts from the Annual Report of the Chairman of the Commission for the fiscal year ended November 30th, 1936, will be of interest:—

In reporting on our maritime commerce for 1936 it is worthy of note to recall that this year marks a century of steam on the waters of the Columbia and Williamette Rivers. Built on the Thames, the "Beaver" left London under sail on August 27th, 1835, and "came to abreast of Fort Vancouver, in 9 fathoms" at 7.30 on the evening of April 10th, 1836. After the installation of the "Beaver's" engines at Fort Vancouver, this, the first steamer on the Pacific, made its initial appearance on the Williamette River on May 31st, 1836. From then on, until her ill-fated end on the rocks of Burrard's Inlet in July, 1888, the steamer "Beaver" played an important part in the waterborne freight and passenger traffic of the Pacific North-west.

During the last fiscal year $79,658.12 was expended on maintenance. Gross operating revenues during the past year amounted to $369,939.03, as compared to $330,090.14 in 1935.

Because of strike conditions, no operations were carried on in November, so the past fiscal year was actually an eleven months operation. Nevertheless, it is encouraging to note that the Commission's deep-sea tonnage in 1936 amounted to 733,740 tons, or 112,527 tons more than in 1935 and greater than any year since 1931. With an operating revenue 12% greater than in 1935, the operating expense increased only 3.26%. While the Commission's tonnage showed substantial gain in 1936, the total deep-sea tonnage for the entire port was 4,681,326 tons—or only 155,912 tons above the previous year.

An important point in the development of water transportation was reached when, on July 22nd, the river steamer "The Dalles" was the first vessel to pass through the ship lock at Bonneville Dam now under construction.

The Report is signed by Mr. John H. Burgard, the Chairman. Appended thereto are a series of general port statistics, descriptions of private water-front facilities, tonnage comparisons and other information of interest to shipping and commercial interests.

Riverside Materials-Handling Plant and Electrical Equipment

Installation at Erith, Kent

(Communicated).

During the last few years rapid developments in the building industry have drawn attention to the possibilities of the use of gypsum in the manufacture of plaster board, which is now employed extensively as a base for plastering and also for direct decoration. A notable firm of manufacturers of plaster board for the building industry of this country is The British Plaster Board, Ltd., of Wallasey, Cheshire, which produces various well-known types of plaster lath, wall board, and plaster in large quantities at its new riverside factory at Erith, Kent. The raw materials chiefly employed for this purpose are gypsum, paper and water, and the maintenance of a constant supply of these materials is essential to the efficient running of the factory. The British Plaster Board wharf on the Thames was therefore equipped with a complete ship's unloading and handling plant capable of unloading gypsum (below 4-in. size) and putting it into storage at the rate of 200 tons per hour and reclaiming at a rate of 50 tons per hour when required to supply the process plant or for re-shipment into barges. Cargoes of gypsum are usually brought in vessels of from 6,000 to 10,000 tons, and a 6,000-ton ship can be completely unloaded in four days; the unloading capacity is higher than reclaiming, firstly in order to allow the year's supply of gypsum to be stored during the summer (the only period during which the ships are able to obtain their cargoes from the St. Lawrence River, which is ice-bound in winter), and secondly to despatch the vessels quickly and thus save demurrage charges.

Fig. 1. General View of the Pier and Unloading Equipment at the Wharf of the British Plaster Board, Ltd.

In connection with the new factory a large contract for mechanical and electrical plant was placed with The General Electric Co., Ltd., of Magnet House, Kingsway, London, W.C.2. The unloading and handling plant comprises a system of cranes, belt conveyors, elevators, drag scraper, and crushers, the whole of which (with the exception of the cranes) was manufactured and supplied by Fraser and Chalmers Engineering Works (Proprietors: The General Electric Co., Ltd.), Erith, Kent, in association with the Robins Conveying Belt Co. Further, Fraser and Chalmers-Robins handling equipment is installed in the process plant section. The factory is completely electrified, the handling plant and much of the process plant being driven by "Witton" motors; about 100 motors aggregating 1,400 h.p. are installed and were manufactured at the Witton Engineering Works of the G.E.C.

A general view of the T-headed pier on the Thames front is seen in Fig. 1, while Fig. 2 shows a ship unloading. Gypsum or coal is reclaimed from the ship's hold by two level luffing grab cranes, one on each jetty or arm of the pier. These cranes discharge into two large travelling hoppers, from which belt feeders feed the material at the rate of 20-ft. per minute to two horizontal belt conveyors travelling at 150-ft. per minute; the capacity of each feeder and conveyor unit is 100 tons per hour.

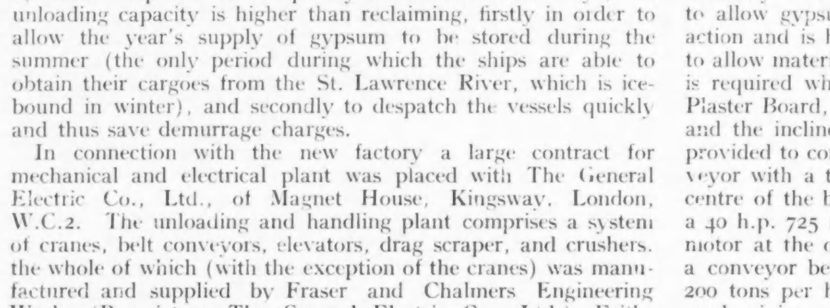


Fig. 2. A Ship unloading at the Jetty.

The feeders are chain driven by 3 h.p. 725 r.p.m. squirrel cage motors, while the conveyors, which are in an exposed position, are chain driven by 5 h.p. 720 r.p.m. totally enclosed squirrel cage motors. Fig. 3 shows one of the cranes discharging into the hopper with the belt conveyor below, while Fig. 4 shows the inner ends of the jetty conveyors with one of the motor drives.

The jetty conveyors run towards the centre of the pier head and discharge on to a 200-ft. inclined belt conveyor, which runs up the pier. This conveyor has a capacity (at a speed of 300-ft. per minute) of 200 tons per hour, and it is equipped with a Blake Denison automatic belt weighing machine, which records the weight of material unloaded. It is driven through gearing by a 20 h.p. 705 r.p.m. slip-ring motor placed at the head end (seen in the foreground of Fig. 5).

From this conveyor material is transferred through a chute to a 400-ft. main conveyor, which passes through the factory. Gypsum is discharged on to an inclined conveyor reaching out into the storage ground and equipped with a telescopic chute discharging on to an initial conical storage pile of about 2,500 tons. When unloading coal a travelling plough (which is normally lifted clear of the main conveyor belt by a hand winch to allow gypsum to pass without obstruction) is brought into action and is hand traversed above the coal bunkers. In order to allow material to be reclaimed from storage into barges (which is required when gypsum is sold to other works of The British Plaster Board, Ltd., or to outside firms) both the main conveyor and the inclined pier conveyor are reversible, an elevator being provided to connect the two conveyors and a boom loading conveyor with a telescopic chute at the pier head to load over the centre of the barge (Fig. 4). The main conveyor is fitted with a 40 h.p. 725 r.p.m. motor at one end and a 15 h.p. 700 r.p.m. motor at the other; normally the 40 h.p. motor is used, giving a conveyor belt speed of 300-ft. per minute and a capacity of 200 tons per hour, but when reclaiming the 15 h.p. motor is used, giving a belt speed of 200-ft. per minute and a capacity of 50 tons per hour, special control equipment being employed to enable the conveying belt to be reversed from push-button starters. The tail end of the inclined conveyor over the strong pile is driven (through a clutch) by the head end of the main conveyor. The reclaiming elevator is chain-driven by a $7\frac{1}{2}$ h.p. 945 r.p.m. cowl-cooled squirrel cage motor, seen at the top of Fig. 5; the boom loading conveyor is driven off the tail end of the inclined pier elevator, and the boom is hinged so that when not in use it can be raised clear of passing ships as shown in Fig. 4.

All the conveyors mentioned have 24-in. belts carried on troughing idlers.

Gypsum is distributed from the initial conical pile over the storage area by means of a drag scraper seen in operation in Fig. 6. This scraper consists of a bucket of 2 cubic yards capacity, which is operated by a rope system from a Sauermann reversing winch driven through V-rope by a 75 h.p. 960 r.p.m. slip-ring motor. From the winch the rope passes through a movable bridle travelling on a rope stretched between two 80-ft. high masts, the movement of the bridle being controlled by hand winches attached to the masts; other bridles are provided for travelling down the guy ropes on these masts. The full bucket travels out when stocking at a speed of 200-ft. per minute, and returns empty at 600-ft. per minute. A fan-shaped pile of approximately 50,000 tons capacity is formed, the maximum storage area being utilised.

Reclaiming is also carried out by this scraper with the ropes reversed. In this case the full bucket travels inwards at 200-ft. per minute and returns empty at

Riverside Materials-Handling Plant and Electrical Equipment—continued

600-ft. per minute. The reclaimed gypsum is deposited by the scraper into a ground receiving hopper, from which it is extracted by an apron feeder of heavy construction supplying a single-roll 18-in. by 24-in. Pennsylvania crusher, which reduces the rock to about 2-in.; this crusher is belt driven by a 35 h.p. slip-ring motor, the

Fig. 3. Gypsum being discharged into a hopper with belt conveyor below.

feeder being chain driven from the crusher. An elevator, chain driven by a 10 h.p. 950 r.p.m. squirrel cage motor, lifts the crushed rock on to a picking belt conveyor which is driven from the elevator. This conveyor discharges either into the bin or to the reversible main conveyor for re-shipment. It may be noted that an 18-in. by 32-in. Witton-Kramer magnetic separator pulley (supplied from a 2 kw. motor generator set) is installed in conjunction with the picking belt in order to prevent stray iron from being carried forward to the hammer mill mentioned in the next paragraph.

The rock is withdrawn from the bin by means of an apron feeder and delivered to a scraper conveyor. Both the scraper and apron feeder are belt driven from a 5 h.p. 705 r.p.m. motor. The scraper conveyor delivers the rock into the rotary drier, which is driven by a 25 h.p. 705 r.p.m. slip-ring motor. The air is drawn from the furnace through the drier by means of a

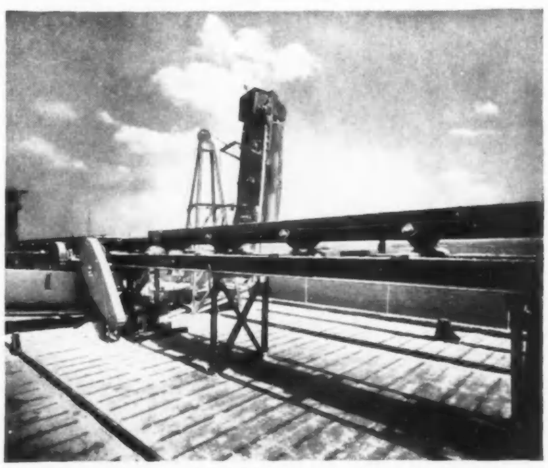


Fig. 4. The inner ends of the belt conveyors on the jetty showing one of the totally-enclosed squirrel cage motors.

fan driven by a 10 h.p. 700 r.p.m. slip-ring motor. After drying, the crushed rock is fed into a 48-in. Pennsylvania hammer mill, which is driven by a 75 h.p. 960 r.p.m. slip-ring motor. From the hammer mill the material is air separated, and the fines removed and sent to the ground material bin. The air separators are 14-ft. and 16-ft. in diameter and are driven by 35 and 45 h.p. slip-ring motors respectively, both running at 1,440 r.p.m. The over-size from the separators is fed to two Raymond pulverisers, each of which is driven through V-ropes by a 75 h.p. 725 r.p.m. slip-ring motor. The fines from these pulverisers are removed by means of two fans, each direct coupled to a 75 h.p. 1,455 r.p.m. slip-ring motor; the air circuit is bled through a Visco-Beth dust collector. Four screw conveyors, each driven through worm

Fig. 5. The head end of the 200-ft. inclined pier conveyor and the top of the reclaiming elevator.

gears by a 2 h.p. 940 r.p.m. squirrel cage motor, are used to distribute the fines and over-size products from each of the two separators to the proper point. Three further conveyors of the drag-link type feed two screw cross conveyors which discharge into two similar underground conveyors. The underground conveyors feed two Fraser and Chalmers bucket elevators (each driven by V-rope and chain by a 7½ h.p. 950 r.p.m. squirrel cage motor), which lift the material to the top of the silos.

From the silos the material is withdrawn by means of rotary feeders and screw conveyors and fed into three calcining kettles, which are rotated at 15 r.p.m. by 25 h.p. 705 r.p.m. slip-ring motors driving through V-ropes and chains. After leaving the kettles the material passes through further processing plant, for which a number of drag-link conveyors, elevators and worm conveyors are used and are driven by G.E.C. motors of various sizes. The Fraser and Chalmers elevators employed are of the chain-and-bucket type with double roller chain and a special clean discharge feature.

Fig 6. Drag scraper distributing gypsum over the storage ground.

The finished plaster is stored in large silos, each of which is emptied by means of drag-link conveyors driven by 5 h.p. 705 r.p.m. squirrel cage motors through worm reducers and chain. One of these silos serves the mixing and packing machines used for hand wall plaster. The mixing machine is driven through V-rope and chain by a 25 h.p. 705 r.p.m. slip-ring motor, while the two packing machines are each driven by 3 h.p. 950 r.p.m squirrel cage motors.

For the manufacture of plaster board the plaster is stored in a long bin of triangular section. As the top of this bin is at a

Riverside Materials-Handling Plant and Electrical Equipment—continued

considerably higher level than the screw conveyor bringing plaster from the kettles, a Redler conveyor (manufactured by Fraser and Chalmers Engineering Works) is installed. first lifting the plaster to the necessary height and then running horizontally over the top of the bin; the conveyor discharges through a gate in the bottom of the casing, thus filling the bin automatically. This conveyor is driven by a 5 h.p. 950 r.p.m. squirrel motor. The bin is emptied by a drag-link conveyor driven through V-rope and spur gears by a 7½ h.p. 950 r.p.m squirrel cage motor.

The manufacture of the plaster board begins in a mixing machine, which is driven by a 10 h.p. 950 r.p.m. vertical spindle motor. From this mixer the plaster is delivered on to the board machine where it is formed into a continuous sheet. It then passes over a long belt conveyor and through a large board drier in which warm air is circulated by a fan driven by an 80 h.p. 725 r.p.m. slip-ring motor. The long conveyor and the cross feed to the drier are driven through V-ropes and a complicated system of gearing and chains by a 20 h.p. slip-ring motor. The cross-feed itself is controlled and a cutter and tippler table are operated by three Witton-Kramer a.c. solenoids; the tippler table enables the boards to enter the drier at any level required.

An a.c. supply for the electrical equipment is taken from the 400-volt 3-phase 50-cycle mains of the Erith Urban District Council.

Standard types of motors and control gear are used throughout, most of the motors above 5 h.p. are slip-ring machines controlled by air-break rotor starters in the small sizes and by oil-immersed rotor starting panels in the large sizes. On the two-motor belt conveyor automatic contactor starting panels are employed with electrical inter-locking. The remaining drives are equipped with squirrel cage motors, those below 5 h.p. being fitted with direct-to-line contactor starters. Except where specifically mentioned, protected type motors (with totally enclosed slip-ring covers on slip-ring machines) are used.

The whole of the electrical equipment was installed by Messrs. W. H. Trace and Son, of Birkenhead.

In conclusion, acknowledgment should be made to The British Plaster Board, Ltd., and to their Chief Engineer and Manager, Mr. D. W. Griswold, for assistance in the preparation of this description.

Coasting Trade : Modern Development and Trend

By M. ARNET ROBINSON, M.Inst.T.

** Paper read before the Birmingham and District Section of the Institute of Transport on November 10th, 1936, and repeated before the Manchester-Liverpool and District Section on April 2nd, 1937*

THE coasting trade of this island kingdom has of recent years received a merited though possibly somewhat belated recognition in government, administrative and commercial circles. I do not propose to burden this paper with extensive statistics, but it has been computed that over 1,200 ships are employed, and directly or indirectly the coasting trade gives employment to numbers to be reckoned in tens of thousands. As a training ground for seamen it is unequalled. It provides an essential element in any balanced naval power with its supply of officers and men trained to the handling of small vessels in all conditions and weather, and with an unrivalled knowledge of the ports (including small ones not used by deep-sea vessels) and the coasts and estuaries of the United Kingdom. It may be remarked that the coaster regularly uses channels and routes of necessity not available to large vessels.

Economics of the Industry

To stress the essential cheapness of sea transport is almost platitudinous. There is no element, not excluding the air, which provides such buoyancy for the load to be moved, combined with complete freedom from any charges for capital outlay or repairs and renewals. **Prima facie** there should be no doubt that between two points which are sea-connected, the water route should be the most economical. Yet, at the same time, it is known that the coasting trade has recently passed through difficult times from which it is only just emerging, and there are still directions in which this apparently economic form of transport is not being used to the extent it was some years ago. This merits reflection and will be of interest both to the provider and user of the transport service.

In analysing this position, I shall seek to show that while, as with all healthy industries, there is a steady development, redirection of forces, and recasting of ideas, yet the essential service which the industry has to offer of cheap and reliable transport is not only available to the trading community to an extent and with an efficiency not hitherto obtained but is still capable of great development.

The core of the matter economically is the extent to which the transportation is actually by sea. The ideal in this direction is where the works or factory has access by sea and the goods or products to be transported have to be delivered to a terminal point similarly situated. Thousands of tons of traffic are moved coastwise which come within this category. Cement is shipped direct from the works and taken to waterside depots, from which supplies are drawn as required; cake and meal are shipped from mills to other waterside mills for remanufacture; flour and grain products are shipped from mills to waterside terminal points, and there are numerous other examples. Much of the enormous trade in coal from the north-east coast to London power stations is waterborne nearly all the way, as the haul from the pit to the coaster is very short, while at the destination end the coaster, specially designed to go under the Thames bridges, is discharged direct into the power stations by most efficient plant. There is also a large trade where the coaster goes alongside the importing ocean vessel and receives a cargo of raw material for transfer to mill or factory. In all such cases the cost of transport is extremely low, and the inherent cheapness of sea transport is exemplified to the fullest degree. It is not surprising to observe that many of the most modern and efficient factories and mills have been built with their own wharves and even, in some cases, with private docks. The coasting industry is alive to this development, and there is a steadily increasing trade to and from such private wharves, not only by coasting tramps taking full cargoes but also by the liners which call at regular intervals or on specified days to load parcels as required by the works organisation. It is not always easy for the liner companies which run to regular schedules, to fit in these extra calls, but the position has to be met, even if it means recasting existing schedules. This tendency in industrial practice will, in my opinion, increase and it is important for the coasting companies to adjust their arrangements to fulfil the legitimate requirements of the traders.

Another aspect of modern trade requirements which has been commented on in several papers read before the Institute is the hand-to-mouth method of ordering supplies, with the consequent reluctance to hold large stocks on the part of the distributor or retailer. This in turn necessitates the supplier or manufacturer himself having stocks readily available near the point of demand, unless he is to be faced with having to despatch small consignments direct from the works with the penalty of high transport charges. This has led to a steadily increasing use of the depot system. The depots are distributed round the country at points most suitable to cover the areas required and distribution is made from these depots to the local area. By this system the trader fulfils the requirements of his customers while retaining the benefit of cheap sea transport. The coasting companies have co-operated with traders in establishing the system, and thousands of tons of traffic move each year into depots established at nearly all ports in the United Kingdom. I shall refer to this subject again when dealing with port equipment.

Where it is not possible to deliver direct to a coaster, cheap transport can frequently be obtained by barging. This is the next best thing to direct delivery and, in fact, some measure of barging is generally necessary from all docks and wharves to supplement direct shipment and to increase flexibility of transport. The merits of London and Hull as cheap barging ports are well known.

It is when one comes to general inland trade from warehouse to warehouse or factory to customer that more complicated factors arise. With this class of trade, in addition to the actual sea carriage, cartage is incurred at each end and dues and wharfage have to be paid. Here considerable changes have taken place in the last decade, both as regards the rate

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Coasting Trade—continued

structure and method of charging. In the coasting liner trade the established practice which persisted until recent times was for the sea freight charge to be the basis of all trades, that is to say, a rate was quoted for the sea transportation proper which covered the shipowner for the actual carriage of the goods plus the labour at each end for putting the goods in and taking out of the ship. All other charges were additional and were charged as they arose. Cartage might be incurred at one end or both; dues—normally payable to a port authority—were set out in a separate column; in addition, any charges for wharfage, f.o.b. consolidated charges, landing charges, and so on, were also placed in an appropriate column in the freight debit note. This system worked well on the whole, and is certainly advantageous to the freight operator in that the actual freight earned by the ship is the basis of the throughout charge. The system is, of course, almost invariably used in deep-sea transportation, and is of necessity still the practice in the coasting trade for f.o.b. or c.i.f. transactions. It is unnecessary to attempt to analyse the constituents which form the practice for quoting sea freight rates, but it may be stated that the coasting industry followed the general railway practice to a large extent of charging "what the traffic will bear." This description of a method of charging has been the subject of recent criticism, and the method itself has also been strongly deprecated in some quarters. The meaning of the phrase in actual application is, at any rate, I think, generally understood as being that goods of a high value are charged a higher rate than goods of low value without any attempt to assess the difference in transportation costs involved.

It is notorious that road transport has profoundly modified this conception, as that new branch of transport has not accepted this principle of charging but works generally on actual cost. This means that any goods of reasonable bulk in relation to weight, and provided they are not particularly fragile or of any objectionable nature, will be accepted at an approximately level freight rate. From this has arisen, by steady stages, a countervailing reply from the older transport agencies following this levelling and standardising process which is to be seen in flat rates, bulk rates, special contract rates, and so on. As a natural consequence, the coasting carriers have had to follow, though somewhat reluctantly, and with, I think, a proper sense of their responsibilities in the issue involved. I use these words advisedly, in view of the difference in costing between the railway route and that of the coaster. With the railway it is claimed that any revenue, however small, over actual running expenses is some contribution towards the standing charges which represent so large a proportion of the total costs. With the coaster it is different: the size of the ship is definitely limited, and it can be said at any one time by a freight manager that a freight below a certain level will be unremunerative. However, the tendency persists, and it is the task of the coasting industry to see how best the altered practice can be met.

When one speaks of flat rates and standardisation, anyone conversant with port charges and standard shipping practice will at once be struck by the amazing variety of conditions which apply and the complexity of the charges. There are hardly two ports where the method of charging, let alone the level of charges, is alike. At some there are dues inward but not outward, on goods landed on the quay, but not when delivered overside; at some there are wharfage charges, levied sometimes by the port authority, sometimes by the shipowner; at others there are duties levied by municipal authorities in addition to anything charged by the port authority itself. I am aware that these practices have evolved over a period of time, that they have an historical background of sound commercial practice, and that it is manifestly impracticable, even if desirable, suddenly to apply a standardised method of charging to all ports. It is nevertheless pertinent to enquire whether a stage has not been reached now when some sweeping changes are necessary if the coasting industry is going to be able to meet successfully this new challenge. It may well be asked whether any complexity of port charging has much bearing on the ability of the coasting industry to meet the competition of flat and standardised rates. I think it can easily be shown that it has, and I would exemplify the matter as follows: Assume that the standard rate—and by "standard" I mean in the sense in which I have just put forward the proposition, and not the technical railway "standard" rate—between Ports A and B is 25s. od. per ton. In computing a competitive rate by coaster allowance must be made for cartage at each end, and labour for putting the goods into and out of the ship—say 12s. od. per ton for these services. There is now 13s. od. left to be on level terms. At Port A, the shipping port, the only terminal charge is port dues, and on the suppositious traffic under consideration the rate is 1s. od. per ton. At Port B, the receiving port, there are also only dues to pay, which are 2s. od. per ton. So that is now a gross outgoing of 15s. od. per ton, leaving 10s. od. per ton clear for the ship. But take the same traffic between Ports C and D. At Port C there is a shipping charge of 2s. od. per ton, the dues are heavier at 2s. od. per ton—total 4s. od. per ton at the shipping port. At the receiving Port D there is a wharfage charge of 3s. od. per ton and dues also 3s. od. per ton—total 6s. od. per ton: and giving a combined figure of 10s. od. per ton. There is now a total figure for outgoings in the case of Ports C and D of 22s. od. per ton, leaving 3s. od. only for the ship on level terms with the competitive rate. In the first case the coaster could compete, in the second it could not.

It may well be suggested that this is an exaggerated picture. I have admittedly given two extreme cases, but I can give the assurance that it is only a matter of degree and that the problem presented by these varying charges is a very real one. It is not easy to suggest a complete remedy, but one can suggest lines where much might be done. Wharfage and similar charges where controlled directly or indirectly by the shipowning company should be analysed strictly on a cost basis. Most, however, of the charges involved are levied by outside authorities, and it is to these authorities that the coasting industry must look for help. Many port authorities have already given valuable assistance, but I consider that there is considerable scope for further investigation of the incidence of these port charges. The object is mutual, both to increase the traffic carried coastwise and to augment port revenues. It is in itself anomalous that where the coaster is competing against a standard rate (the figure I used was 25s. od. per ton) the dues which have to be paid vary as much as 4s. od. per ton. In practice the result is more serious than a fortuitous difference in net revenue to the ship, since higher dues will certainly result in some cases in the traffic not moving by coaster at all as the resultant freight left to the ship will be unremunerative. Surely there is a case here for co-operation between the coasting owners and the port authorities to devise some scheme whereby dues on such traffic could be levied at a rate and in a form which would encourage the traffic to move by sea. This might be achieved by flat rates, compounded rates, or even on a lump sum basis. It is undoubtedly a fact that a large port which made a sweeping concession in dues to coasting trade has reaped the benefit by the ability of the coasting services there, not only to maintain but considerably to increase their trade.

It will be noticed that I have dealt with the situation as it is and have not referred to the question of whether it is desirable that such development should have occurred. That is a big question to which reference has been made in many papers read before the Institute.

Port Facilities

The modern coasting vessel to which I shall refer later, is of great technical efficiency. It is equally important that port facilities and equipment should be up to date and suited to modern trade requirements. Many ports have spent large sums in the last few years on modernising their equipment. Much, however, remains to be done, and it is with somewhat questioning eyes that anyone interested in the welfare of the coasting shipping industry may contemplate the vast expenditure on trunk roads in the past decade, and wonder whether some portion at least might not have been allotted to the ports. In dealing with port facilities, I refer chiefly to the requirements of the coasting liners. The tramps with bulk cargoes are not affected to the same degree.

Accessibility is of prime importance. Where the rise and fall of tide is sufficiently small to obviate the necessity of closed docks, a port has a tremendous advantage. Where locks are essential it is highly desirable that there should be some lock where ships can enter or leave if possible at any state of the tide, but at least with several hours range each side of high water. At the Gladstone Dock, Liverpool, a coaster can lock in or out at any state of the tide. At other ports it is only possible for one hour or even less each side of high water. What a serious matter this is will be realised when the arrival of a ship only one hour too late to lock in on a particular tide means not the loss fo one hour but of a whole day, or at least a heavy cost for working at overtime rates. For example, if the tide serves at 8 a.m. and a ship arrives at 10 a.m., the lock gates having been closed at 9 a.m., she will not be able to dock until 8 or 9 o'clock the same night, and normally would not be able to start until the following morning.

The shed at which the coaster works when in dock is worthy of careful consideration. At some ports the coasting sheds are of most up-to-date and efficient lay-out and equipment; at others much is required to bring them to the standard required to-day. I am aware that it is one of the tenets of normal dock operation that the function of a transit shed is to provide a duct for the passage of goods from a ship to their final destination, and that they must be passed through such a shed as quickly as is reasonably possible. This is to ensure that valuable quayage is not wasted and, as a corrective to any delay, various rent charges and penalty rents are levied if the free period, generally 72 hours, is exceeded. Even in the deep sea trades this conception has in essence been modified in recent years, particularly in the readiness of port authorities to lease

Coasting Trade—continued

to private traders sites with quayage giving direct water access to works or mills.

The sheds used by the coasting liner companies are usually rented by them for their exclusive use. It is certainly not in their interest to allow unnecessary congestion in these sheds. But, as I have tried to show earlier in this paper, there is a considerable trade for which, if it is to move by coaster, it is essential to offer depot facilities at the receiving end. It is to be hoped that this problem will receive the sympathetic attention of port authorities with a view to the coasting companies being able to extend and improve further these facilities. It is gratifying to see that this is specially advocated by Sir Lionel Warner in his paper "Some considerations of problems affecting port management"* read in London on January 11th, 1937. The following paragraph is significant:—

"This procedure was all very well when the transport charges either by land or water carriage were small, but to-day these charges are all substantial, and what the trader requires is elimination of charges of double handling and transport. Would it not be a sound policy in planning for the future, either by replacement or bringing facilities up to date, to aim at reduction in the costs I have named and give the trader warehousing facilities at the back of the transit sheds or above them in order to cut out transport charges which could be avoided? Differing trades need differing facilities, but if I had my way in designing a modern dock system I would certainly aim at a system which allowed for cheap and direct warehousing for the trades which require it."

Such advocacy from such an authority is encouraging to those who feel that this matter is of great importance to the future prosperity of the coasting liner trade.

A modern coasting shed should be double-storied, and in some cases even more storeys may be found desirable. For general cargo working it is essential that the shed should be sufficiently close to the quay edge for ship's derricks and shore cranes to deliver straight into the shed. The floors should be smooth, and efficient means must be provided for the rapid delivery of goods from the shed to railway trucks or road vehicles. For the ground floor there are two main types of shed, the level floor and the raised platform. Each has points in its favour and, as a matter of practical operation, it will be found that any theoretical advantage may well be offset by some long-standing custom and inherited technique. Any upper storey should have a wood floor and means of delivery be provided by shutes, gantry cranes and jiggers. It is notorious how uneven is the flow of vehicles for delivery of goods and how much delays are naturally resented by traffic operators, so that the lay-out and equipment of the means of loading from the shed should receive the most searching attention. The aim in view with the ideal shed should be sufficient quayage to accommodate the largest coaster using the berth, cranes to enable the ship to discharge all holds simultaneously—"as fast as the ship can deliver" to use the well-known shipping phrase—and at the same time a lay-out and internal equipment which will enable the cargo to be correctly sorted and stacked to mark at the time of discharge from the ship. There are several coasting sheds throughout the country which approximate to this ideal, others fall seriously short.

Even with a well-equipped and designed shed efficient operation demands a high standard of organisation to achieve this object of rapid discharge from the ship, correct stacking to mark in the proper place in the shed, and delivery to rail or road vehicle with the avoidance of congestion and vexatious delays. Discharge of the ships is performed by dock labourers who are normally casual labourers. While this is technically their designation, in the coasting liner trade, certain men regularly follow the same company and are in practice regularly employed on the same vessels. This not only gives the men a considerable measure of continuity of employment which is so desirable, but also ensures a high degree of skill in handling the particular cargoes involved. As an example, it may be pertinent to interpolate here a comment on the increasing use by traders of small fibre-board cartons, and even paper packages, in place of bags or wooden boxes. In order to handle these cartons without damage the shipping companies have evolved a particular type of scale board with corner pieces permanently rove. These have proved extremely effective, and the dockers who are handling this class of traffic have proved most competent in loading and discharging a type of cargo which at the outset might well have caused considerable difficulty. In one trade of my own company a coaster loads each week, as part of a general cargo, an average fo 25,000 of such packages, and there is almost a complete absence of any breakage or damage.

Cranes to assist discharge of the ship are of great value. These are complementary to ships' derricks which are, of course, in general use. There is, however, an obvious limit to the number of these derricks which can be stepped and rigged in any one ship, quite apart from the capital cost involved. The great advantage of shore cranes is that they enable more gangs of men to be employed simultaneously than would be possible with derricks alone, and also provide greater flexibility of operation. For example, cranes can discharge to upper storeys of sheds which cannot be reached by derricks, and they can work to the shore while derricks work overside to barges on the outside. Winches and derricks have been considerably improved recently. For a long time there was little or no change in the standard fitting of steam winch and derrick which can only be swung by hand guys. This limited the methods of working to two; either the derrick with its load of cargo had to be swung over by a guy, or else the derrick was left fixed amidships and used simply as a means of raising or lowering the lift, long stage planks being fitted from the quay right over the hatch, and trucks being used for the transfer from the hatch to the quayside. Both these methods are still in use to-day, and are particularly suitable for certain conditions and trades.

Superior methods have been evolved for the coasting liner which is handling cargoes of miscellaneous goods. Winches are now in regular use, which not only lift but also slew the derrick over the ship's side. There are even some which luff in addition to the other two movements. These undoubtedly give better results for handling general cargo than the old methods. In some cases cranes fixed to the ship's deck are used.

* Institute Journal, Vol. 18, pp. 195-206.

Melbourne Harbour

Excerpts from Sixtieth Annual Report of the Commissioners for the Year 1936

Mr. J. H. McCutchan, F.C.I.S., Secretary of the Trust, retired from the service on the 30th September, after 52 years' service, and the Commissioners appointed Mr. A. C. Cook, their Industrial Officer, to succeed Mr. McCutchan as Secretary.

Owing to ill-health, Mr. C. K. W. Allison, M.I.E., Aust., Chief Engineer, resigned from the service at the end of the year, and Mr. J. B. O. Hosking, B.Sc., M.C.E., C.E., Assoc.M.Inst.C.E., A.M.I.E. (Aust.), was appointed Chief Engineer.

Shipping

The tonnage of shipping entering the port showed a steady increase, being 13,950,961 gross tons, an increase of 4% on that of last year. This is the greatest tonnage which has entered the port during its existence, and exceeds the best pre-depression year, 1927, by 11%.

Trade

During the year 1936, the trade of the port showed continued improvement, reached the record total of 5,911,667 tons and was greater than that of 1935 by 659,126 tons, an increase of 12 per cent. The best pre-depression year was 1927, when the trade was 5,319,721 tons.

The tonnage of imports, 3,924,003 tons, was much in excess of that of the previous year, showing an increase of 11%.

The tonnage of exports was 1,987,664 tons—a 15 % increase.

A comparison of the total trade of the port yearly since 1931 when the trade was considerably reduced owing to the financial depression, is set out hereunder:—

Year	Tons	Year	Tons
1931 ...	3,322,506	1934 ...	4,669,255
1932 ...	3,935,209	1935 ...	5,252,541
1933 ...	4,354,200	1936 ...	5,911,667

The above shows an increase of 83% over the six years.

Finance

	£
The Revenue for year was	789,994
The Revenue Expenditure (including £135,578 to the Consolidated Revenue of Victoria, and £15,000 to Geelong Harbour Trust, being the equivalent of one-fifth of Trust's Gross Revenue)	786,063
Surplus	£3,931

Port Improvements

The expenditure during 1936 on Port Improvements (Capital Works) amounts to £74,967.

Prevention of Pillage

The satisfactory work of the Wharf Police Patrol, combined with the compounding of the Oversea Berths in the Victoria Dock, has again resulted in the claims against shipowners for pillage of oversea goods from the wharves being low, namely, .61 pence per ton on the oversea cargo landed.

Prior to the preventive measures set out above being taken, the average per ton of cargo was 2s.

The Report was signed by Geo. Kermode (Chairman), Messrs J. A. Boyd, D. McLennan, F. Duncan and D. York Syme (Commissioners), and A. C. Cook (Secretary).

Port of Rangoon

Excerpts from the Annual Report of the Commissioners for the Year 1936-37

Accounts

Revenue Account.—The year's working has resulted in an excess of income over expenditure amounting to Rs. 2,52,498 as against an estimated figure of Rs. 1,53,034. Compared with the previous year, income shows an increase of Rs. 22,233 and expenditure an increase of Rs. 23,980.

Capital Account.—The total expenditure during 1936-37 was Rs. 6,06,877. No new loan was raised, but the Capital Account was balanced by contributions of Rs. 3,17,456 from the balance brought forward on Revenue Account at the beginning of the year and Rs. 2,50,000 from the Revenue of the year.

Pilot Fund.—The year's working resulted in an excess of income over expenditure amounting to Rs. 30,372. Compared with the preceding year, income shows a decrease of Rs. 10,646 and expenditure a decrease of Rs. 15,119; the former being due to the fall in the tonnage of shipping entering the port and the latter mainly to profit on redemption of a Provident Fund investment.

Traffic

Number and Tonnage of Sea-going Vessels.—The total net tonnage of steamers entering the port was 4,140,590 tons, or 138,049 tons less than that of the previous year. Out of the 1,517 vessels that entered, 921 came alongside the Commissioners' wharves, pontoons and jetties for the purpose of disembarking passengers and discharging cargo, as compared with 959 vessels in 1935-36.

Sea-borne Trade.—The total sea-borne trade of Rangoon amounted to 5,288,142 tons, representing an increase of 47,642 tons or approximately 1% of that of the previous year; of this total 1,718,326 tons were handled over the Commissioners' premises.

Passenger Traffic.—During the year 227,519 passengers by sea landed at, and 208,778 embarked from, the Commissioners' wharves and jetties as compared with 250,656 and 210,969, respectively, during the previous year.

New Works

Lanmadaw Foreshore Development and Improvement.—The three blocks of godowns, D, E and F, sanctioned in August and September, 1935, as part of the scheme for the development of the foreshore between Godwin Road and Stevenson Street were completed and brought into use. An estimate was sanctioned for the construction of four additional goddowns on block C, and for the entire reconstruction and re-alignment of the fish and poultry depots, together with road and railway improvements. At the end of the year the new fish market was almost completed and partly occupied; the railway siding and roadway were ready for use and the foundations and floors of the godowns were completed awaiting delivery of steel for the superstructure.

During the year Crisp Street No. 3 jetty was constructed and put into commission. A certain amount of outward movement and settlement was observed in the vicinity and it was considered desirable to carry the piles down to a lower level than originally intended; steel piles 60-ft. long were therefore substituted for the 40-ft. reinforced concrete piles originally intended.

The Phongyi Street upper pontoon jetty and the Oliphant Street lower jetty were replaced by reinforced concrete structures.

General

Reduction of Charges.—The rebates in the rental charges for lands and godowns sanctioned in 1934, and the reduction in the Port Due and in wharfage and landing and shipping charges introduced in 1935 remained operative throughout the year.

In March, 1937, the Commissioners sanctioned a rebate of $6\frac{1}{4}\%$ in the River Due, approved reductions amounting to approximately 25% in the charges leviable on river craft and abolished the charge of Re. 1 per package on unmanifested passengers' baggage. They also approved an increase in the rebate on Pilotage fees from 10% to 20%. These concessions take effect from 1st April, 1937, and represent about Rs. $2\frac{1}{4}$ lacs per annum. In the last 10 years the Commissioners have made reductions of charges estimated at Rs. 24 lacs per annum.

The Report was signed by Mr. A. N. Strong, Chairman of the Board.

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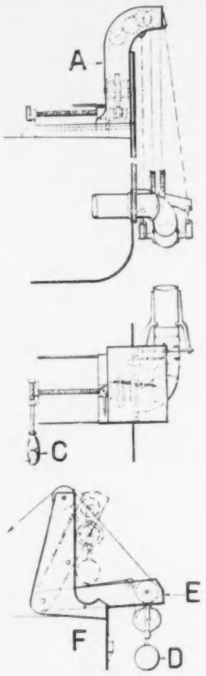

PATENT FOR STOWING SUCTION PIPE OF SUCTION HOPPER DREDGERS

a.) Movement of the after part.

In the working position the elbow piece of the suction pipe forms a continuation of the spoil pump intake in the ship's side. The outer edge of the frame A is in line with the shell plating, and both are fitted with continuous guide rails, on which the after end of the suction pipe is hoisted by the engine C. When this has reached the top position, the frame A is racked inboard by the engine C on thwartship guide rails until the whole is stowed clear of the ship's side.

b.) Movement of the forward part.

The suction pipe mouth-piece D is carried by a steel wire rope from a winch barrel on the forward deck. When hoisting takes place the suction pipe rises until the blocks meet, the beam E then lifts to an almost vertical position, and a bar is passed through the frame and the beam. The suction pipe is then lowered into the housing F.

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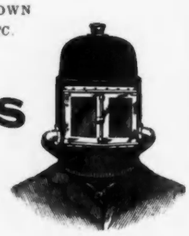

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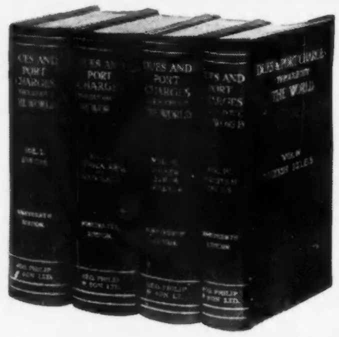

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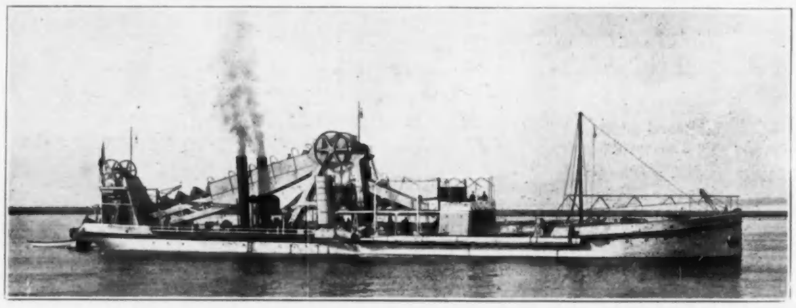

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